Explicit teaching of Japanese mimetic words using voicing, gemination, and reduplication rules

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Submitted to the graduate degree program in Linguistics
and the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements
for the degree of Doctor of Philosophy.

Date Defended: 3 May 2017

The dissertation committee for Kotoko Nakata certifies that this is the approved version of the following dissertation:

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Chair: Dr. Joan A. Sereno

Date Approved: 3 May 2017

Abstract

Mimetics are commonly used by Japanese native speakers to express the manner of actions and sensations. However, they are often not taught explicitly in many Japanese language classrooms. The current study tested a novel teaching methodology to help English-speaking learners of Japanese learn Japanese mimetics. Second language learners were explicitly taught three phonological/morphological rules during learning. The three rules are: (i) voicing, (ii) gemination, and (iii) reduplication. In Japanese mimetics, these phonological/morphological factors systematically affect the meaning of mimetics.

The current study examined whether explicitly teaching these three rules helps English-speaking learners of Japanese, who vary in Japanese proficiency, acquire mimetics as well as help them generalize these rules to newly encountered mimetics. The procedure used a Pretest-Learning-Posttest design. First, all participants took a Pretest. Approximately one week later, all participants learned mimetics during a Learning Session. In the Learning Session, all participants were taught 32 mimetic words with a verbal description and a static picture along with a sentence that contained the mimetic word. There were two different participant groups in the Learning Session: an Experimental Group and a Control Group. The Experimental group explicitly learned the three phonological/morphological rules while the Control group did not. Finally, all learners

participated in a Posttest and a Delayed posttest (approximately 4 weeks later) to assess their retention of the mimetic vocabulary.

We found that the novel teaching methodology (teaching mimetics with a picture and a context along with a verbal description) is effective in acquiring and remembering mimetics. Participants showed a great improvement after the Learning Session for both the trained mimetics and newly introduced mimetics, suggesting that participants successfully learned the mimetics and the sound regularities both with and without the explicit introduction of the three phonological/morphological rules.

Additionally, we also found that learners who were explicitly taught the three phonological/morphological rules showed a greater improvement than those who were not. Therefore, the explicit introduction of the sound regularities is more effective in the current methodology.

We also found that the proposed methodology is effective regardless of learners' proficiency in Japanese. While advanced learners overall acquired more mimetics than beginning learners, beginning learners showed a greater improvement than advanced learners. These results suggest that teaching mimetics does not need to be limited to advanced learners (as it often is in Japanese language classrooms) but it should be encouraged for learners at all levels.

Acknowledgements

I am deeply thankful to my committee chair, Dr. Joan A. Sereno whose encouragement, guidance and support from the initial to the final level enabled me to complete the dissertation. Without her guidance and persistent help, this dissertation would not have been possible. I would also like to express my gratitude to my committee members, Dr. Allard Jongman, Dr. Utako Minai, Dr. Alison Gabriele, and Dr. Maggie Childs in addition to those who supported me during the completion of this study.

I would also like to express my very profound gratitude to my parents and my husband for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this dissertation.

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Chapter 1: Mimetics and Word/Vocabulary Learning

The Japanese lexicon can be grouped into three word classes according to the origin of the words: Yamato words (native Japanese), Sino-Japanese, and loan words. Yamato words are native Japanese words that have been inherited from Old Japanese, rather than being borrowed at some stage. Sino-Japanese refers to Japanese vocabulary that originated in Chinese or has been created from elements borrowed from Chinese. Loan words refer to Japanese words of foreign origin that were not borrowed in ancient times from Old or Middle Chinese, but primarily from English or from other European languages. However, McCawley (1968) and Ito and Mester (1993) discuss the necessity of grouping the Japanese lexicon into four classes in terms of their phonological characteristics: Yamato words (native Japanese), Sino-Japanese, mimetics, and loan words. It has been argued that mimetics are by nature sound-symbolic or iconic. They constitute an independent word class with particular phonological and morphological properties. Mimetics have often been excluded from theoretical investigation and have not received analyses as extensive as other word classes such as native and Sino-Japanese words (Tsujimura, 2005). However, it needs to be noted that all the phonemes and their combinations found in mimetics are also found elsewhere in the Japanese lexicon (Kita, 1997).

The current study will examine Japanese mimetic words. First, the characteristics of Japanese mimetics words in terms of their phonetics, phonology, morphology, and semantics will

be discussed. Considering the systematic and frequent use of mimetics, we will then discuss acquisition of mimetic words. The current proposed study will systematically examine different methods for teaching mimetics to second language learners of Japanese.

Despite the fact that mimetics are commonly used by Japanese native speakers to express the manner of actions or states, feelings, and sensations, they are not taught explicitly in many Japanese language classrooms. The current study will propose a teaching methodology specifically made for learning Japanese mimetics in which learners will be explicitly taught three phonological/morphological rules during learning. The three rules are: (i) voicing, (ii) gemination, and (iii) reduplication. Each of these phonological factors affects the meaning of mimetics. For example, mimetics with voiced sounds often express largeness, heaviness, roughness, and aggressiveness of the subject, whereas mimetics with voiceless sounds often express smallness, lightness, smoothness, and quickness. Gemination expresses that the movement/action is quick and instant, or the change of state is quick and occurs at one point. Reduplication expresses that the movement/action is repeated continuously.

The current study will thus examine whether explicitly teaching these three rules helps English-speaking learners of Japanese acquire mimetics. Moreover, by having a posttest and a delayed posttest (approximately 4 weeks later), long-term retention of mimetic knowledge will be investigated. Finally, the current study will examine word learning across different L2

proficiencies of the learners by having two proficiency levels in terms of their college class level and in terms of their knowledge of general vocabulary.

1.1. What are mimetic words?

Japanese mimetics can be roughly partitioned into two types: Gitaigo and Giongo. Gitaigo are words that imitate physical modes such as actions and physiological states (e.g. “boing-boing” in English). They can include gijyogo which depict psychological states or bodily feelings. Gitaigo also refers to experiences that are related to vision, touch, taste, and olfaction. Giongo are a smaller number of onomatopoetic words that imitate sounds (e.g. “bang” in English). They can include giseigo which imitate sounds made by living things (e.g. “bowwow” in English). In this paper, mimetics will refer to the first group, gitaigo.

Unlike Indo-European languages, which have few mimetic words, Japanese has the second largest number of mimetics following Korean. Mimetic words are frequently used in daily conversations and also used in a wide range of market outlets such as newspapers, comic books, novels, and magazines. It is said that there are over 2000 mimetic words in Japanese (BMFT Publisher Japan, 2012). Mimetics are commonly used in daily life among native speakers of Japanese since they provide speakers with a rich means of expression that reveal subtle sensitivity. Their expressive meanings are immediately understood, and most expressions are readily

identifiable for native speakers of Japanese (Hamano, 1998).

Japanese mimetics have been attracting attention for the semantic impact that they provide. The number and the use of mimetic words have been increasing in the past 20 years (NHK Close-up Gendai, 2013). According to a database of the Japanese Diet Record, the usage count of mimetic words at the National Diet has increased to more than double in 2011 as compared to 1990 (Osaka University, 2011). This is because of the rich image a mimetic word carries in its sound. For example, the adjective 'soft' is yawarakai in Japanese. Many food companies have started naming their products using mimetic words because people tend to buy products with sound that relate to their meaning. For instance, people prefer bread called "Fuwa-fuwa Bread" to a bread simply called "Bread" (BMFT "Words expressing tastes", 2012).

Not only are mimetics ubiquitous in adult language, but they also are acquired by children extensively and accurately from early on (Oda, 2000). In Nagumo, Imai, Kita, Haryu, and Kajikawa (2006), 22 Japanese mothers described pictures depicting a person acting in relation to an object (e.g., a boy throwing a ball, rolling a carpet, jumping over a flower, wiping a mirror with a cloth, etc.) to their children (18–20 months). Altogether, 577 references to the actions were made when the mothers were talking to their children, and 57% of the action references were made using mimetic words, while 39% were made using conventional verbs.

Mimetics are an essential word class in Japanese. They are frequently used in daily life

both in speech and written form. Mimetics have rich expression, revealing subtle sensitivity and vivid images to listeners.

1.2. Vocabulary learning in L2

Vocabulary knowledge is fundamental to the development of proficiency in foreign language. There is a myriad of research on the acquisition of foreign language vocabulary such as the relevance of context for vocabulary learning, the role of instructions, learners' L1 background, and learners' individual difference in age, proficiency, aptitude, and motivation (Ellis, 1995; Krashen, 1982, 1988). There is a general consensus that knowing a word is defined as knowing the semantic concepts the word represents, the associations the word evokes, the word's connotations, its collocations, social and stylistic limitations, its derivative possibilities, its syntactic and morphological behavior, and the possibility of multiple meanings (Kang & Golden, 1994). Therefore, ideal vocabulary learning involves a gradual incremental process in which learners are exposed to a variety of contexts and tasks that require them to repeatedly and actively put the knowledge into practice by using it. Tohsaku (1999) proposed a Communicative Approach (Savignon & Berns, 1984; Widdowson, 1985; Oxford, 1990) which encourages learners to interact with one another and the teacher in realistic situations. The goal of a communicative-based approach is to teach students how to use the target language in real-life situations through

a variety of activities that serve as the basis for communicative interaction in the classroom.

Successful learning and recall of foreign vocabulary can be facilitated by classroom instruction that includes: supplying L1 translations of words, teaching definitions, using mnemonic devices and techniques, teaching word families, situational sets and semantic sets, pointing out and manipulating word relationships, and using rich oral and written contexts (Oxford & Crookall, 1990). Classroom activities that require learners to interact with and manipulate words in various ways as well as requiring learners to promote and reinforce deep processing of the words are a must for meaningful learning and effective recall (Ellis, 1995).

1.3. Imagery-based strategies for vocabulary learning

Sensory imagery, and particularly visual imagery, has proven to be an effective instructional tool to help learners make necessary cognitive associations between what they know and the new word. Dual Coding Theory (DCT), proposed by Paivio (1971, 1986, 1991) is a general theory of cognition that applies to both verbal and nonverbal cognition. DCT assumes that cognition occurs in two independent but connected codes: a verbal code for language and a nonverbal code for mental imagery. The verbal code is specialized for representing and processing language in all its form, including speech and writing, whereas the nonverbal code deals with the representation and processing of nonverbal objects, events, and situations (Sadoski, 2005). The

verbal representations are called logogens and the nonverbal representation is called imagens (Paivio, 1978). Words can be defined as verbal labels for concepts which belong to a nonverbal system. According to DCT, when the word is abstract (e.g. “true”), it has less access to nonverbal imagery, whereas a concrete word (e.g. “tree”) has direct sensory referents. Therefore, concrete language has an advantage over abstract language because it can be more readily represented and processed in two codes. It also needs to be noted that DCT assumes individual differences in verbal or imaginal thinking; some people are better or quicker at connecting the logogens or imagens and some people are better at verbal thinking more than imaginal thinking (Sadoski, 2005).

DCT principles can be useful in understanding the acquisition and teaching vocabulary. The theory suggests that building referential links between accurate mental representations of word meanings expressed verbally (logogens) and mental images of relevant pictures (imagens) can significantly facilitate the learning and retention of these meanings (Allemand, 2003). In fact, DCT principles have been directly applied to using imagery in the teaching of meaningful vocabulary in empirical studies.

Bull and Wittrock (1971) used pictures and mental imagery in teaching definitions of unfamiliar words. Participants were 87 fifth-grader and they were taught 18 nouns drawn from a seventh-grade spelling list. Half were relatively concrete words and half were relatively abstract

words. The students were randomly assigned to one of three conditions: verbal definition only, verbal definition plus illustration, or verbal definition plus self-discovered imagery, where the students had to draw their own illustrations of the definitions. Testing after one week indicated retention did not differ between concrete and abstract words. However, the self-discovered imagery group performed significantly better than the definitions-only group, and the difference between the definitions only group and definition-plus-illustration group approached significance; the definition-plus-illustration group performed better than the definitions only group. Bull and Wittrock (1971) concluded that imagery, at least when combined with self-discovery, has practical significance in the learning of definitions by children in classroom settings.

Smith, Stahl, and Neil (1987) investigated vocabulary learning among college students using pictorial and verbal contexts. 142 undergraduates learned 50 words (nouns and other word classes) that were unknown to them. No control for word concreteness was used. The students were grouped into three conditions: definition only, definition and a sentence using the word in context, or the definition, a sentence using the word in context, and a simple picture illustrating the meaning of the word. An immediate post-test of the definitions showed that the group who received all three treatments scored highest, but the difference was not significantly different from the other groups. However, a two-week delayed post-test revealed a significant difference

between the definition only group and the definition-plus-sentence-plus-imagery group, the latter group performed significantly better than the former group.

This finding was extended by Smith, Miller, Grossman, and Valeri-Gold (1994). They conducted two studies with a total of 166 undergraduates who were taught conceptually complex nouns, verbs, and adjectives which were assumed (but not tested) to be unknown. The students were divided into two groups: definition and a sentence using the word in context, or definition, sentence, and illustration. Word concreteness was not controlled. In both studies, students who received the illustrations scored significantly higher on both immediate and delayed post-tests than those who did not receive the illustrations. Nouns, verbs, and adjectives were learned equally well. Smith et al. (1994) also examined whether hemispheric preference in thinking would affect the learning. It turned out that left-brain preference thinkers, who were presumably less inclined to normally use imagery in their thinking, benefited significantly more than right-brain preference thinkers from the illustrations.

Interestingly, the imagery-based methods are not commonly used in the L2 classroom teaching environment, especially in intermediate and advanced levels. This is because intermediate and advanced level vocabulary tend to be more abstract, therefore, not illustratable in many cases. Moreover, learners are assumed to understand the meaning of the word by its definition and from the context in which it appears. However, what if the new word in the L2 can

be imaged? Examples of such words are mimetics.

1.4. Teaching of Japanese mimetic words to non-native speakers

Japanese has more than 2000 mimetics and other kinds of onomatopoeias which are numerous when compared to other languages; particularly when compared to Indo-European languages. Among all kinds of onomatopoeias, mimetics especially are considered to be one of the hardest word categories to master for adult second language learners (Ivanova, 2006) due to several reasons. First, Japanese mimetics often do not have an exact translation in learners' first language. Second, one mimetic word can have multiple meanings depending on the context in which it appears.

Despite the fact that mimetics are commonly used by Japanese native speakers to express the manner of actions or states, feelings, and sensations, they are not taught explicitly in Japanese language classrooms. Mikami (2006) studied the recent pedagogical approaches to learning Japanese mimetics and onomatopoeias. She explicitly states that the crucial problem is that mimetic words and onomatopoeias are not taught in Japanese language classes, especially at the beginner level, due to the fact that mimetic words tend to be considered as supplementary vocabulary; therefore they are not introduced in most of textbooks until advanced levels. However, even at the advanced level, only around 30 words are explicitly introduced (Mikami, 2006).

The necessity of teaching mimetics has been attracting attention from Japanese instructors. Allemand (2003) asked five Japanese textbook authors and six Japanese language educators to respond to questionnaires regarding the necessity of teaching mimetics and other types of onomatopoeias. The five authors considered the following eight textbooks which are most-widely used college-level Japanese language textbooks: Yookoso! An Invitation to Contemporary Japanese (1999), Yookoso! Continuing with Contemporary Japanese (1999), Nakama 1 (1998) and Nakama 2 (2000), Japanese: The Spoken Language, Volume 1 (1987), Volume 2 (1988), Volume3 (1990), Living Language: Japanese All the Way (Basic to Intermediate) (1996). According to the questionnaire, all five authors and six of the teachers indicated by their responses that Japanese language educators should teach students mimetics. Based on personal experiences, they found that most students enjoy it and find it easy to remember. Several of the educators stated that they thought it would be fun to teach mimetics more extensively than they have in the past and that they would make conscious efforts to introduce more of them in their classrooms in the future. They confirmed the idea that mimetics are undoubtedly a major part of the Japanese language and that a person who wants to be truly fluent has to know how to use mimetics. All of the teachers felt that it is the responsibility of classroom instructors to create realistic contexts in which authentic language can be introduced to students. Within such real-life contexts, students should participate in language tasks requiring them to

describe given scenes, events, and sounds. Allemand (2003) suggested that teachers could introduce sound symbolism, using authentic examples from anime, manga, films, music, and children's books as well as Japanese food and craft items.

Allemand (2003) concluded that Japanese mimetics are necessary in native speech in order to express different conditions (e.g. how it rains or snows), to be descriptive or to make a speaker's speech more animated, dynamic, and exciting. Mimeitcs add immediacy to language, making descriptions vivid; are a reflection of the richness of affective expressions in Japanese; and express the qualities of objects, actions, and intangibles as well as emotional states (Allemand, 2003). Despite the frequent and necessary use of mimetics, they are not integrated into classroom instruction due to limited classroom time for vocabulary instruction, expository texts being used more often than narrative texts (where these words are most often found), and an emphasis on formal grammar instruction. However, these reasons should not prevent teachers from introducing Japanese mimetics in the classroom environment knowing that their students are sure to encounter mimetics in native speech or written materials in the real world.

Chapter 2: Linguistic Characteristics of Mimetics

A brief summary of linguistic characteristics of mimetics is provided below. Their phonetic inventory, phonotactics, morphology, and semantics suggest that mimetics pattern similarly to native Japanese, Sino-Japanese, and loan words.

2.1. Phonetics

2.1.1. Vowels and consonants

All native Japanese, Sino-Japanese, mimetics, and loan words have the same phonetic inventory. Japanese vowels consist of 5 vowels, each of which has short/long distinction: /i/, /i:/, /e/, /e:/, /a/, /a:/, /o/, /o:/, /ɯ/, /ɯ:/. There are 23 consonants in Japanese which are summarized in Table 1. Japanese has gemination (double consonants) and palatalization. Japanese is a moraic language and the notion of mora is predominantly used to account for various phonological phenomena. The mora has one of the following three realizations: (i) (C)V, (ii) the first part of a long consonant (or the first part of a geminate), and (iii) nasal /n/. There are 48 moras excluding geminates and palatalization. In this study, the Romanization system is utilized as the writing system as shown in Table 2. When a mora is palatalized, “y” is inserted between the consonant and the vowel as in *kyo* in “Tokyo”.

		bilabial	alveolar	alveo-palatal	palatal	velar	uvular	glottal
Stops	+V	b	d			g		
	-V	p	t			k		
Fricatives	+V		z	ʑ				
	-V	ɸ	s	ɕ	ç			h
Affricates	+V		dz	dʑ				
	-V		ts	tɕ				
Approximants	+V		r					
	-V				j	w		
Nasals	+V	m	n			ŋ	N	

Table 1: Japanese consonants

a	i	u	e	o
aa	ii	uu	ee	oo
ka	ki	ku	ke	ko
sa	si (shi)	su	se	so
ta	ti (chi)	tsu	te	to
na	ni	nu	ne	no
ha	hi	hu (fu)	he	ho
ma	mi	mu	me	mo
ya		yu		yo
ra	ri	ru	re	ro
wa				wo
n				

Table 2: Japanese Romanization system (48 moras excluding geminates and palatalization)

2.1.2. Accentual pattern

Japanese is a pitch-accent language in which each mora in a word is associated with a specific pitch (Tsujimura, 2007). The pitch pattern of the entire word is predictable given the location of the accent of the word. However, the location of the accent is not predictable. It is

lexically indicated, meaning that the location of accent must be learned separately for each word (Tsujimura, 2007, Oda, 2000).

The accentual pattern of mimetics has not been well studied. According to Oda (2000), the accentual pattern of mimetics is best described in connection to their syntactic contexts and/or morphological properties since it is rare for a word to have multiple accentual patterns in the same syntactic context. The most common cases when a word has more than one accentual pattern is when it can be used in more than one syntactic context. Hamano (1986) has four different patterns of sequences combining pitch falls and intonational falls, and claims that there are subtle semantic differences. In order to discuss the relation between the accentual patterns of mimetics and syntactic contexts or semantic aspects in greater detail, the general accent system of Japanese should be understood first.

There are two rules to follow for a correct accentual pattern. First, the accent "*" marks the location in the word where the pitch falls and the accented mora as well as all the morae preceding it receive a high pitch "H", while the morae after the accented mora receive a low pitch "L". Second, the pitch of the first mora of the word is low unless the accent is located on that mora. These rules make the word's accentual pattern relatively simple as follows: (i) when there is a fall, there is one fall in a word, and (ii) there is always a change of pitch at the beginning of a word. Examples are shown in (1a-e). The accentual pattern of (1d) and (1e) are the same on the

surface after applying the rules; however, they are differentiated when particles are added. The pitch on the particle is low after the accented mora in (1d'), whereas it stays high when there is no accented mora in (1e').

It needs to be noted that if a word is pronounced with the wrong pitch, then the word could mean a different thing as shown in the examples (2a,b). It is also important to know that not all regions in Japan have the same location of the accent. For instance, the association between the accentual patterns and the meanings of the words in the example (2a) are reversed in the Kansai area. To avoid confusion, all the accentual patterns indicated in this paper follow the standard Japanese spoken in the Tokyo area.

(1) a. hoshi* 'star' (LH)

b. hon* 'book' (HL)

c. kokoro* 'heart' (LHL)

d. atama* 'head' (LHH)

e. katachi 'shape' (LHH)

d' atama*-ga 'head is' (LHH-L)

e' katachi-ga 'shape is' (LHH-H)

(2) a. hashi ‘chopstcks’ (HL) vs. hashi ‘bridge’ (LH)

b. ame ‘rain’ (HL) vs. ame ‘candy’ (LH)

The accentual patterns of mimetics follow the same rules as listed above (Oda, 2000). The patterns are best described in connection to their syntactic context and morphological properties (Oda, 2000). For instance, four-mora mimetics that do not end in *–n* or *-ri*, the first mora is accented when they are used as an adverb (3a) or a verb (3b) and no mora is accented when used as an adjective (3c) or a noun (3d). For the examples below, the mimetic “beta” means ‘sticky’ and ‘clingy’ in an uncomfortable way.

(3) a. kono ame-wa betabeta-(to) te-ni tsuku
HLLL- L
this candy-TOP mimetic-(COMP) hand-LOC attach
‘this candy sticks to my hand’

b. kono ame-wa betabeta-suru
HLLL- LL
this candy-TOP mimetic-do
‘this candy sticks’

c. kono ame-wa betabeta-da
LHHH- H
this candy-TOP mimetic-be
‘this candy is sticky’

d. kono betabeta-wa nani?
LHHH-H
this mimetic-TOP what
‘what is this sticky thing?’

2.2. Phonology

Among the four strata proposed by McCawley (1968), native Japanese words have the most restricted phonotactics, and loan words have the least restricted phonotactics. Sino-Japanese and mimetics are in the middle and cannot be ranked with each other in terms of phonotactic freedom (Kita, 1997). It is important to note that all the phonemes and their combinations found in mimetics are found elsewhere in the Japanese lexicon, and moreover, mimetics are not free from most phonological processes that affect words in other strata. However, McCawley (1968) and Ito and Mester (1993) state that mimetics are in some ways less constrained than native words, and they pattern differently from Sino-Japanese.

First, initial consonants /p, b, d, g/ cannot appear in native Japanese words and /p/ cannot appear in Sino-Japanese words. However, there are many occurrences of /p/ at the word initial position in mimetics. Hamano (1986) noted that approximately one-sixth of Japanese sound symbolic words, including both gitaigo and giongo (sound-imitate words), are /p/-initial which is a large number compared to other forms.

Second, sequential voicing, *rendaku,* does not occur in mimetics. *Rendaku* is quite common in Japanese, especially when two or more words are combined in compounding and when a word is repeated twice to make a reduplicated word (which is common in mimetics; e.g. sakusaku 'lightly crunchy'). The *rendaku* process is where the initial consonant of the second

constituent becomes voiced when the following conditions are met: (i) the second constituent is a native Japanese word (however, there are some exceptions), (ii) the second constituent does not have a voiced obstruent (Lyman's Law), and (iii) the potential *rendaku* segment is in a right branch constituent at the lowest level (Right Branch Condition). Examples of *rendaku* are listed below.

(4) Voicing occurs:

a. san 'three' + kai 'floor' >> san-gai 'third floor'

b. toki 'time' + toki 'time' >> toki-doki 'sometimes'

(5) Voicing does NOT occur:

a. tsugi 'next' + tsugi 'next' >> tsugi-tsugi 'one after another' (Lyman's Low violation)

b. saku 'lightly crunchy' + saku 'lightly crunchy' >> saku-saku 'lightly crunchy' (mimetic word)

Third, although it is not common, medial voiced obstruent geminates can occur in mimetics. This phenomenon is limited to mimetics and loan words. Mimetic examples with a medial voiced obstruent geminate are listed below.

(6) a. bobbo 'flames, smoke, steam rising or billowing out intermittently with great force'

b. daddatt ‘something of considerable weight surging forward’

(Garrigues, 1995)

While mimetics have some unique phonological constraints compared to native Japanese or Sino-Japanese words, there are many phonological rules that mimetics seem to follow just like other strata do such as vowel devoicing. When a high vowel /i/ or /u/ appears between two voiceless consonants or when a high vowel is preceded by a voiceless consonant at the word final position, the high vowel undergoes devoicing in Japanese. Not all the dialects of Japanese exhibit high vowel devoicing, however, the phenomenon is quite wide-spread in the Tokyo dialect, while it is not common in the Kansai area including Osaka and Kyoto (Tsujimura, 2007). Examples of high vowel devoicing are listed below, where the underlined vowel indicates that it is devoiced.

(7) Devoicing occurs:

a. s̲i̥karu [ši̥kaɾu] ‘scold’

b. k̲i̥ta [ki̥ta] ‘north’

c. ch̲i̥kai [či̥kai] ‘near’

d. k̲u̥sai [ku̥sai] ‘smelly’

e. fu̲̲sin [ɸɯ̥ɪšin] ‘suspicion’

f. muki̲̲ [mɯkɨ̥] ‘direction’

g. katsu̲̲ [katˢɯ̥ɪ] ‘win’

All native Japanese, Sino-Japanese, and loan words undergo vowel devoicing. The literature on mimetics suggest that mimetics also undergo vowel devoicing when the conditions are met. However, mimetics are always accompanied with a prosodic peak (Kita 1997), meaning that mimetics are often focused and stressed in a sentence.

2.3. Morphology

Mimetics can be divided into two groups morphologically. One is one-mora stem mimetics and the other is two-mora stem mimetics (Kita, 1997). A one-mora stem mimetic consists of a one-mora stem and optional elements (8). Adding optional elements can change the meaning of the mimetic as shown in (8a-d). For the examples below, the mimetic *fu* (8a) means ‘a brief moment; suddenly’, *fu:* (8b) means ‘a blow of wind’, *futt* (8c) means ‘something flashes across one’s mind; suddenly’, and *fun* (8d) means ‘a manner of being arrogant’.

The stems themselves and combinations of optional elements can create one-mora to four-mora mimetics. Not all mimetics are allowed to have a variety of combinations of the

optional elements. For example, *-ri* cannot be attached to the one-mora stem “fu”.

(8) **One-mora stem + optional elements**

a. fu-to kagami-o miru
mimetic-COMP mirror-ACC look
‘look at the mirror suddenly’

b. fu:-to tameiki-o tsuku
mimetic-COMP sigh-ACC do
‘sigh with a blow of a wind’

c. futt-to omoidasu
mimetic-COMP remember
‘suddenly and momentarily remember’

d. fun-to okoru
mimetic-COMP get mad
‘get mad arrogantly’

A two-mora stem mimetic consists of a two-mora stem and optional elements (9). For the examples below, the mimetic *hyoi* (9a) means ‘a light movement’, *hyoitt* (9b) means ‘a light quick movement’, and *goron* (9c) and *gorori* (9d) both mean ‘a manner of a heavy object rolling once’ but in *gorori* (9d), the action is softer.

(9) **Two-mora stem + optional elements**

a. michi-o hyoi-to yokogiru
road-ACC mimetic-COMP cross
‘cross the road easily/lightly’

b. michi-o hyoitt-to yokogiru
road-ACC mimetic-COMP cross
'cross the road very easily/lightly and quickly'

c. ishi-o goron-to korogasu
stone mimetic-COMP roll
'roll the stone once'

d. ishi-o gorori-to korogasu
stone-ACC mimetic-COMP roll
'roll the stone once softly'

Both one-mora stem mimetics and two-mora stem mimetics can be reduplicated (10, 11). For the examples below, the mimetic *fufutt* (10a) means 'a manner of soft laugh', *fufun* (10b) means a manner of being boastful', *hyoihyoi(tt)* (11a) means 'lightly and easily', and *gorogoro* (11b) means 'a manner of a heavy object rolling continuously'.

(10) **Reduplicated one-mora stem + optional elements**

a. fufut-to warau
mimetic-COMP laugh
'laugh softly'

b. fufun-to ibaru
mimetic-COMP pride onself
'pride oneself boastfully'

(11) **Reduplicated two-mora stem + optional elements**

a. nimotsu-o hyoihyoi(tt)-to katsugu
luggage-ACC mimetic-COMP carry overhead
'carry the luggage overhead lightly/easily'

b. ishi-ga gorogoro-to korogat-ta
stone-NOM mimetic-COMP roll-PAST
'The stone tumbled down'

Adding a geminate at the end or in the middle of the word is found to intensify the word or to convey the impression of sudden change or great speed (Hamano, 1986). This difference is described in the example (12a) and (12b). The addition of a gemination to a stem *kuru* in (12b) increases the speed of the action. The mimetic *kurun* (12a) means 'something light circles/turns once' and *kurutt* (12b) means 'something light circles/turns once quickly'.

(12) a. bareri:na-ga kurun-to mawat-ta
ballerina-NOM mimetic-COMP turn-PAST
'ballerina turned once'

b. bareri:na-ga kurutt-to mawat-ta
ballerina-NOM mimetic-COMP turn-PAST
'ballerina turned once quickly'

Reduplication is very common in mimetics. Hamano (1986, 1998) describes that a mimetic of the two-mora stem refers to a single occurrence while multiple repetitions indicate consecutive occurrences and in some cases quickness or forcefulness of an action. This difference is described in the example (13a) and (13b). The non-reduplicated *goron* indicates that the heavy stone did one rotation whereas the reduplicated *gorogoro* indicates that the stone rolled continuously.

(13) a. ishi-o goron-to kotogasu
stone-ACC mimetic-COMP roll
'roll the stone once'

b. ishi-o gorogoro korogasu
stone-ACC mimetic roll
'roll the stone continuously'

2.4. Semantics

Mimetics, in this paper, includes gitaigo and gijyogo. The former expresses the manner of action, states and conditions of inanimate and animate objects, capturing visual, tactile, gustatory, and olfactory aspects (Allemand, 2003). The latter describes emotions, physical reactions to events and experiences, capturing their affective aspects (Allemand, 2003). Japanese mimetics evoke striking multisensory images of experiences and states; therefore they are often used not only in daily speech but also in written contexts or media among Japanese native speakers. However, semantic identification of mimetics is not as straightforward as other word classes because a large majority is not indexical or denotational (Diffloth, 1972, Tsujimura, 2003). Mimetics are by definition symbolic or iconic rather than referring to specific objects and concepts. Many standard Japanese dictionaries leave out mimetics or make separate dictionaries dedicated only to mimetics and other types of onomatopoeias.

2.4.1. Two-dimensional approach to mimetics

The vague and elusive nature of meanings of mimetics is captured by Diffloth's (1972) term, "an expressive mode of meaning". His insight has led Kita (1997) to propose two levels of semantic representations, the affect-imagistic dimension of meaning and the analytical dimension of meaning.

According to Kita (1997), the semantic representation of Japanese mimetics belongs to the affect-imagistic dimension, in which language has direct contact with sensory, motor, and affective information. Iconicity is an important architectural principle in this dimension. Information not only about a speaker's affective attitudinal state, but also about outside events or states that are perceived by a speaker, such as a motion event, can be contained in the affect-imagistic dimension.

On the other hand, other words (non-mimetic words) belong to the analytical dimension, where meaning is represented as a hierarchical structure of decontextualized semantic primitives. This dimension includes descriptive information which can be "explicitly asserted or denied and objectively verified" (Lyons, 1977). The analytic representation is amodal in that its format of information is not specific to any cognitive modality (Kita, 1997).

Kita (1997) demonstrates evidence for a separate dimension for mimetics. For example, he claims that both adverbial and nominal mimetics can be used even when they are seemingly redundant, that is, when they do not add any referential potential to the sentence. He concludes

that this is because both adverbial and nominal mimetics exist in the affect-imagistic dimension.

In (14a), both the adverb [isogiashi de] ‘with hurried feet’ and the verb [hayaaruki-o shita] ‘did haste walk’ describe hastiness in the analytic dimension. The adverb creates wordiness since it is syntactically optional and semantically redundant since the same piece of information is present elsewhere in the same dimension. On the other hand, in (14b), the hastiness encoded by the adverbial mimetic [sutasuta-to] belongs to the affecto-imagistic dimension, whereas the verb belongs to the analytic dimension. Thus, the seemingly redundant second encoding of "hastiness" is not redundant, resulting in non-wordiness of the adverbial mimetic. Rather, adding the adverbial mimetic makes the description more vivid and experiential in tone.

(14) a. [Taro wa] [isogi ashi-de [hayaaruki-o] shi -ta.
Tar-Top hurried feet-with haste walk-ACC do Past
‘Taro walked hastily hurriedly (lit. ‘Taro did haste-walk with hurried feet')

b. [Taro wa] [sutasuta-to] [hayaaruki-o] shi -ta.
Taro-Top mimetic-COMP haste walk-ACC do Past
‘Taro walked hurriedly.'

(Kita, 1997)

Tsujimura (2001) argues against Kita’s (1997) claim by stating that the wordiness/redundancy indicated in (14a) can be attributed to the fact that the adverb ‘with hurried feet’ and the verb ‘do haste walk’ mean virtually the same, and this has very little to do with the two dimensions. She also points out that both adverb and verb refer to feet and describe the

manner of fast walking, whereas the mimetic in (14b) describes the manner of motion that is beyond fast walking. The mimetic "sutasuta" refers to fast walking but also expresses smoothness of the movement. Hence, it is not clear whether the difference between (14a) and (14b) should come from the nature of the dimension.

2.4.2. Constructional approach to mimetics

While Kita (1997) claims that the semantics of a mimetic and that of other parts of a sentence are not fully integrated with each other despite the fact that they are syntactically integrated, Tsujimura (2001, 2005, 2014) argues that mimetics are totally integrated into the rest of the sentence. She claims that a specific interpretation of a mimetic word's multiple meanings is determined only when global information throughout the sentence is taken into consideration. Tsujimura (2005) demonstrates that Japanese verbal mimetics (mimetic + -suru 'do') supports the constructional approach developed by Goldberg (1995) who claims that verb meaning comes not from the meaning of the verb alone or the composition of the meaning of the verb and the meaning of other constituents in a sentence, but from the composition of the meaning of the verb and the meaning of the construction in which it occurs. She borrows examples of the mimetic word "burabura" from Ono (1994) and demonstrates that the variety in the event and aspectual types cannot be attributed to the semantic property of the mimetic word alone. The mimetic word

“burabura” is a reduplicated form of a two-mora stem “bura” whose dictionary definition is (i) describe the motion of a hanging or drooping object swaying under an external force (15a, 15d), (ii) to stroll about in a relaxed way (15b), or (iii) to live one’s life or pass one’s time idly without any particular aim (15c) (Ono 1994; 319).

(15) a. doa-no totte-ga burabura-suru
door-GEN knob-NOM mimetic-do
‘The door knob is loose’

b. Taro-ga ko:en-o burabura-suru
Taro-NOM park-ACC mimetic-do
‘Taro strolls leisurely in the park’

c. Taro-ga uchi-de burabura-si-teiru
Taro-NOM home-LOC mimetic-do-PROG
‘Taro is being lazy at home’

d. Taro-ga asi-o burabura-saseru
Taro-NOM leg-ACC mimetic-make.do
‘Taro swings his legs’

(Ono, 1994)

While (15a) and (15d) are both subsumed by the definition of (i), the event type in these examples are quite different; (15a) is a stative description, whereas (15d) denotes a causative event that brings about motion. The aspectual type differs between (15a) and (15b); (15a) is stative, whereas (15b) is an atelic activity. Transitivity also differs among the four examples; (15a), (15b), and (15c) are in the intransitive frame, whereas (15d) appears in the transitive frame. The animacy

of the subject also affects the interpretation of the mimetic word; (15a) has an inanimate subject, whereas (15b) and (15c) have an animate subject. Thus, Ono (1994) claims that the varying meanings of "burabura" are not to be attributed to the mimetic verb alone, but should be deduced from the construction in which it appears.

Tsujimura and Deguchi (2007) claim that the meanings of mimetics are well integrated into the semantic properties of the linguistic environments in which they appear in a non-trivial way. They discuss semantic integration of mimetics that give rise to specific aspectual interpretations.

The sense of repetition associated with reduplicated mimetics affects the telicity of the sentence in which they occur (Tsujimura and Deguchi, 2007). The sentences that do not contain mimetics (16a,b) are aspectually ambiguous; the telicity of the sentence is underspecified in that the events are construed either telic or atelic. However, when reduplicated mimetics are added in (17a,b), the atelic interpretation is much preferred. The mimetic *gokugoku* (17a) mean 'the sound and motion of drinking liquid repeatedly/continuously' and *kurukuru* (17b) means 'continuous rounding movement'. Hence, the mimetics in (17a,b) restrict the interpretation of the events which potentially bear an ambiguous aspectual status. This suggests that the semantic contribution mimetics make is not subordinate to any parts of the sentences; rather they provide a crucial factor in the determination of telicity.

(16) a. Mizu-o gohunkan / gohun-de nonda
water-ACC for/in 5 minutes drank
'I drank water for/in 5 minutes'

b. Ko:en-no mawari-o ichijikan / ichijikan-de aruita
park-GEN around-ACC for/in an hour walked
'I walked around the park for/in an hour'

(17) a. Mizu-o gofunkan / *?gohun-de gokugoku nonda
water-ACC for/*?in 5 minutes mimetic drank
'I drank water (repeatedly) for/*?in 5 minutes'

b. Ko:en-no mawari-o ichijikan / *?ichijikan-de kurukuru aruita
park-GEN around-ACC for/*?in an hour mimetic walked
'I walked around the park (repeatedly) for/*?in an hour'

(Tsujimura & Deguchi, 2007)

Whether mimetics belong to a different semantic dimension from the rest of words (Kita, 1997) is debatable. However, the meanings of mimetics are well integrated into the semantic properties of the linguistic environments in which they appear (Tsujimura and Deguchi, 2007). One mimetic word can carry various meanings and each meaning is not attributed to the mimetic alone, but should be deduced from the construction in which it appears (Tsujimura, 2005).

2.5. Contrastive characteristics of mimetics

The current study examines three phonological/morphological characteristics that are systematic to mimetics: voicing, gemination, and reduplication.

2.5.1. Voicing

The voicing distinction in Japanese is often contrastive in mimetics. Hamano (1998) claimed that in C1VC2V-based mimetic adverbs, voicing contrasts in obstruents are more salient on the initial consonant C1 than the second consonant C2 (Hamano, 1998). The voicing contrast in C1 involves a semantic contrast in terms of 'mass/weight'. Hamano (1998) claims that voiced obstruents such as /b, d, g, z/ symbolize heaviness and largeness whereas voiceless obstruents such as /p, t, k, s/ symbolize lightness and smallness. Examples (18a) and (19a) have a voiced obstruent and examples (18b) and (19b) have a voiceless obstruent in C1 position. The voicing contrast of the examples (a. and b.) affects the size and weight of the object which is the subject of each sentence.

(18) a. Hyoo-ga bara-bara hutte kita.
hail-NOM mimetic fall came
'Hailstones began falling in big heavy drops.'

b. Ame-ga para-para hutte kita.
rain-NOM mimetic fall came
'It started to sprinkle.'

(19) a. Doro-tto sita mizu
mimetic-COMP did water
'murky water'

b. Toro-tto sita hatimitu
mimetic-COMP did honey
'thick and smooth honey'

(Hamano, 1998)

Haryu and Zhao (2007) investigated whether learners of Japanese are sensitive to such sound regularities. Haryu and Zhao (2007) investigated the symbolic value of voiced sounds and voiceless sounds in Japanese speakers (N=42), Chinese speakers who had studied Japanese (N=40), and Chinese speakers who had no knowledge of Japanese (N=37). In the experiment, the participants were asked to look at two pictures, a small object making a small sound (e.g. a small vase being broken) and a big object making a big sound (e.g. a big vase being broken). They were then asked to listen to either an existing Japanese mimetic word or an onomatopoetic non-word and pick one of the two pictures that matched the sound. There were 14 voiced-voiceless stimulus pairs that consisted of existing Japanese mimetic words and onomatopoetic non-words. The onomatopoetic non-words were created based on 7 existing voiced-voiceless pairs of Japanese mimetic words; the word-initial consonant and the same consonant in the duplicate (either voiced or voiceless) was replaced by another voiced/voiceless consonant in the non-word stimuli.

The results showed that Japanese speakers tended to associate voiced sounds with largeness and voiceless sounds with smallness, whereas Chinese speakers with no knowledge of Japanese did not notice those symbolic values. Most importantly, Chinese speakers who had studied Japanese showed more sensitivity toward the symbolic value than Chinese speakers with

no knowledge of Japanese. These results may suggest that having experience in the language may play an important role in being aware of the regularities.

In order to examine whether the amount of experience influences the ability to detect the Japanese-specific sound regularities, they conducted another experiment with the same stimuli and procedures to compare the performances of second-year learners and fourth-year learners. The results showed no significant difference between the two groups for both existing and novel onomatopoetic words. They claimed that the amount of language experience does not affect learners' ability to detect language-specific sounds regularities.

These results in Haryu and Zhao (2007) could be interpreted in a different way. Haryu and Zhao (2007) had Chinese-speaking learners of Japanese whose native language is Chinese, which does not have a voiced/voiceless distinction but an aspiration distinction (/t/ vs. /th/). Therefore, it might be the case that the learners learned the voicing distinction in Japanese; thus, they could perceive the difference between the voiced and voiceless consonants which resulted in them showing different perceptual patterns from the Chinese speakers who had no knowledge of Japanese, but similar to the Japanese native speakers. Therefore, it is important to consider the learners' perceptual representations in both first and second language when assessing the learnability of the voicing regularities.

Nakata (2013, 2014) investigated sound regularities in Japanese using Japanese mimetic

non-words in which the voicing of consonants was examined and vowel influence was controlled. We examined whether the voicing contrast in consonants (/t, k, s/ vs. /d, g, z/) affects perception in Japanese native speakers, English native speakers who had no knowledge of Japanese, and English-speaking learners of Japanese. If learners respond similarly to either the Japanese or English participants, it would suggest that the perception of voicing contrast may be affected not only by the native language but also by the second language, in other words, that sound regularities may be learnable by second language learners. The results showed that English learners of Japanese associated the voiced stimuli with bigness, badness, and clumsiness and they associated the voiceless stimuli with smallness, goodness, and gracefulness. This pattern was similar to that of both Japanese native speakers and English native speakers. However, learners responded more similarly to the English speakers than to the Japanese speakers on the round-spiky dimension; the learners associated the voiced sounds with roundness and the voiceless sounds with spikiness, similar to the English native speakers. Further analyses within the learners revealed that English-speaking learners of Japanese show a stronger voicing distinction on the big-small categorization when they are more familiar with the Japanese language. These results suggest that English learners of Japanese might have different perceptual representations for voiceless and voiced sounds from those of English monolinguals.

Both English and Japanese have two categories for the voicing contrast, voiceless and

voiced, however the two categories are not exactly the same acoustically. Different values of Voice Onset Time (VOT) are used for distinguishing the two categories in each language. According to Lisker and Abramson (1964), there are three major categories of VOT across languages: lead voicing, short-lag VOT, and long-lag VOT. The voiced/voiceless distinction in English is generally described as a short-lag/long-lag VOT distinction. English initial voiced stops /b, d, g/ have either short VOT or pre-voicing whereas English initial voiceless stops /p, t, k/ are aspirated and they have long VOT (Flege, 1982). The voiced/voiceless distinction in Japanese is generally described as a lead/short-lag VOT distinction. Japanese voiced stops are fully voiced and Japanese voiceless stops are almost always unaspirated (Tsujimura, 2007).

Harada (2003) looked at VOTs of both voiced and voiceless stops in English and Japanese produced by 6 monolingual English and Japanese adults. He found that the productions of /d, g/ by monolinguals at the word initial position in English were in the same acoustic VOT region as /p, t/ in Japanese as shown in Figure 1. Voiced stops in English overlap in VOT with voiceless stops in Japanese.

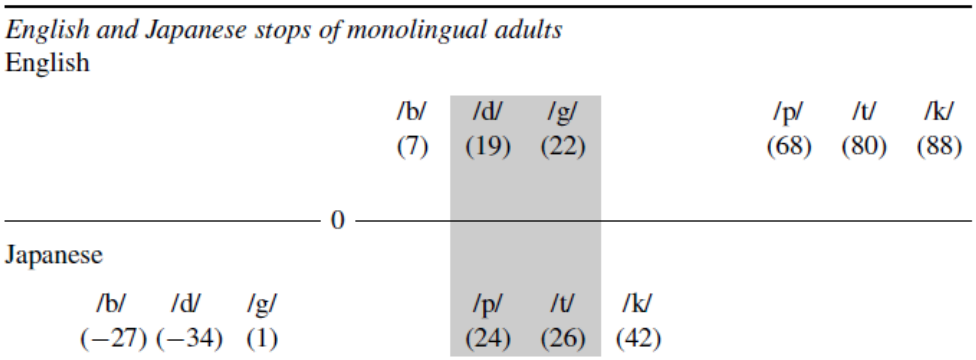

Figure 1: Schematic representations of the VOT (in ms) values for English and Japanese stops at the word initial position of monolingual adults from Harada (2003)

It is possible that the learners of Japanese have the ability to perceive the Japanese voiceless stimuli as voiceless more often than the English monolinguals because of their different perceptual representations for the voiceless sound as learners of Japanese. Moreover, advanced learners might be able to perceive the Japanese voiceless stimuli as voiceless more often than those who are less familiar with the Japanese language because of their more Japanese-like perceptual representations. In fact, the advanced learners in Nakata (2014) perceived the Japanese voiceless stimuli as voiceless more often and they perceived the Japanese voiced stimuli as voiced more often compared to the beginning learners.

2.5.2. Gemination

Gemination is another important phonological characteristic of Japanese mimetics. Adding a geminate at the end or in the middle of the word is found to intensify the word or to

convey the impression of sudden change or great speed (Hamano, 1986). Singletons have shorter and geminates have longer stop closure durations. For a variety of languages, the consonantal length distinction (singleton vs. geminate) has been found to be accompanied by multiple acoustic correlates such as duration of other segments or non-durational features of the surrounding vowels (Lisker, 1958; Abramson, 1987; Ham, 2001; Idemaru, 2005; Payne, 2005, 2006). As for the consonantal length distinction in Japanese singletons and geminates, Homma (1981) found that vowels were slightly shorter after geminate stops in non-words, and Han (1994) found the same phenomenon in words. In addition, Han (1994) showed that the segments before geminate stops were slightly longer. Campbell (1999) and Kawahara (2006a) both confirmed these findings on a large set of data including words with various stops and multiple vowel contexts. Namely, that the vowel preceding a geminate had a longer duration than the vowel preceding a singleton. Moreover, the vowel following a geminate had a shorter duration than the vowel following a singleton.

Besides the durational covariant, non-durational covariants have been found to be secondary cues to distinguish singleton and geminate stops. For example, Abramson (1987, 1992) reported that the amplitude was greater in post-geminate syllables than in post-singleton syllables in Pattani Malay, a language spoken in southern Thailand. Lahiri and Hankamer (1988) and Hankamer, Lahiri, and Koreman (1989) found higher intensity levels on target syllables in words

with a geminate than in words with a singleton in Turkish and Bengali. As for Japanese, Idemaru and Guion (2008) measured the intensity at the peak of the first and second vowel of target words (e.g. “sepa” vs. “seppa”) and found that the intensity of the preceding vowel relative to the following vowel was greater before a geminate than before a singleton.

2.5.3. Reduplication

Reduplication is also a very common characteristic of mimetics. Hamano (1986, 1998) states that a mimetic of the two-mora stem refers to a single occurrence while multiple repetitions indicate consecutive occurrences. This difference is described in the example (20a) and (20b). The non-reduplicated *goron* indicates that the heavy stone did one rotation whereas the reduplicated *gorogoro* indicates that the stone rolled continuously.

(20) a. ishi-o goron-to kotogasu
stone-ACC mimetic-COMP roll
‘roll a stone once’

b. ishi-o gorogoro korogasu
stone-ACC mimetic roll
‘roll a stone continuously’

Reduplication also describes the stable state of the subject such as the texture as shown in example (21).

(21) yasuri-wa zarazara shiteiru
sand paper-NOM mimetic being
‘the sand paper is rough and sandy’

Chapter 3: Second Language Learning of Mimetics

Recently, teaching mimetics and onomatopoeias to L2 learners of Japanese has been attracting more attention and more learning materials have been created by educators. Koba and Masunaga (2002) created an online dictionary for learners of Japanese in which various types of onomatopoeias are introduced and they are explained with contexts and related phrases. The dictionary can be viewed not only in Japanese but also in English, Chinese, and Korean. Hashimoto and Takeuchi (2010) created an online learning system called ONOMATOPENARI in which learners can look up and refer to onomatopoeic phrases in terms of their meanings, usage, and example contexts. Both the online dictionary (Koba and Masunaga, 2002) and ONOMATOPENARI (Hashimoto and Takeuchi, 2010) emphasize that embedding mimetics and onomatopoeias in context and providing example phrases are essential in order to clarify the meaning of these words.

In addition to dictionary-type learning materials, there are some picture book-style textbooks targeting mimetics (Maeda et al., 2015). However, a number of onomatopoeias which express movement or change of objects and states are not describable in static pictures. In these cases, it is important to create a learning system which introduces onomatopoeias with movement. For example, "Kirakira Onomatopoeias" (http://nihongo.hum.tmu.ac.jp/~nishigori/onomatopee/index.html) is an online multimedia

learning system created by Nishigori (2012). On this website, one can learn Japanese mimetics and onomatopoeias visually and aurally. They provide three learning stages for 73 onomatopoeias and mimetics: “Understand and learn the words”, “Learn from skits”, and “Review exercise”. In “Understand and learn the words”, 73 onomatopoeias are listed as vocabulary and each individual onomatopoeia has its own short video with a written script, meanings, and review exercise. In “Learn from skits”, you can learn the onomatopoeias through skits which are based on the main character's (a college girl) daily life. Her day is divided into seven different conversational situations such as “morning”, “school”, and “part-time job”. Finally in the “Review exercise”, you can test your knowledge of the onomatopoeias you have learned by doing the fundamental exercise, the applied exercise 1, and the applied exercise 2. The fundamental exercise is a fill-in-the-blank task in which learners pick one out of four onomatopoeias provided on the screen which fits the content of the skits. The applied exercise 1 is also a fill-in-the-blank task in which learners pick one out of four onomatopoeias provided on the screen. However, the context in which the onomatopoeia appears is not the same as what was seen in the skits. Lastly, the applied exercise 2 is a more complex type of fill-in-the-blank task in which you type an appropriate onomatopoeia in a sentence. There are seven sentences and seven onomatopoeias provided on the screen. You have to think which onomatopoeia fits in which sentence, and type in the correct onomatopoeia. You get feedback as you answer each question. The website can be read not only in Japanese but

also in English, Chinese, Korean, and Indonesian. “Kirakira Onomatopoeias” is a great source for learners to learn mimetics and onomatopoeias. It introduces the words aurally and visually with movement which is crucial when describing mimetic words.

However, Maeda, Uema, Shirozu, and Matsushita (2015) worry that learners may learn words passively and not actively through this learning system. Maeda et al. (2015) think that interactivity is important when learning vocabulary. Hence, they created a digital picture book system in which animated pictures move or change as learners pick a word. For example, if learners pick a mimetic “shikushiku” ‘to whimper’ which expresses a manner of crying, a girl on the screen starts to whimper. Next, if learners pick a sound word “wa:n” ‘to cry loudly’, the girl on the screen starts crying hard. Maeda et al. (2015) also believe that comparing two onomatopoeias that have different nuances or contrasting meanings is also effective in understanding the meaning of words. Considering these important features in learning onomatopoeias, Maeda et al. (2015) created a digital picture book system that (i) has animated pictures, (ii) allows learners to interactively learn words, (iii) introduces two onomatopoeias whose nuances are different or have opposite meanings, and (iv) introduces onomatopoeias in a simple story context.

To test this, Maeda et al. (2015) conducted a study in which 10 quite advanced learners of Japanese (7 male and 3 female) learned 27 mimetics and 5 sound words through the digital

picture book system. Nine were Chinese-speaking and one was Taiwanese-speaking learners of Japanese who had lived in Japan from 2 to 8 years. 4 learners had lived in Japan for less than 5 years and 6 learners had lived in Japan for more than 5 years.

The 32 words consisted of 20 words selected from 70 basic onomatopoeias proposed by Mikami (2007) that can be described with animated pictures and 12 additional onomatopoeias. Among the 20 basic onomatopoeias, 6 words had lower accuracy for learners in understanding their meaning in a preliminary pilot study. Therefore, the additional 12 onomatopoeias were selected from words that were similar or categorically related to the 6 words. The 32 words are listed in Appendix A with meanings described in the digital picture book. Two words in one box were presented together to the learners and the relation of the two is also indicated in the Table.

The digital picture book had 16 pages introducing the 32 words two at a time. On one page, two words in a box, a sentence with a blank, and background scenery with a human or an inanimate object were provided. The participants were asked to pick a stimulus word from the box and drag it to the blank. Then, the background picture started moving or changing according to the stimulus.

The participants were first asked to learn the 32 words through the digital picture book system, two words at a time on one page. After each page, they were asked to answer whether

they understood the meaning of the words on a scale of 1 to 5 (1: do not understand, 5: understand). After going through all 32 words, the participants were asked to answer the following questions in an interview: the meanings of words (two at a time), whether they had already known the words, and if so, whether the meaning introduced in the system was the same as the one they already knew.

The interview revealed that 6 learners who had lived in Japan for more than 5 years knew 12.5 words and 4 learners who had lived in Japan for less than 5 years knew 13.3 words out of the 32 words.

After the learning session, the participants overall gave 4.1 out of 5 (80% understood) for their self-judged understanding of the words introduced in the system and 67% of the words were accurately answered by the participants. 6 out of 10 participants came to correctly understand more than 10 new words and the most successful participant came to correctly understand 18 new words after learning via the system. The accuracy of answering the meanings of the words is shown in Figure 2.

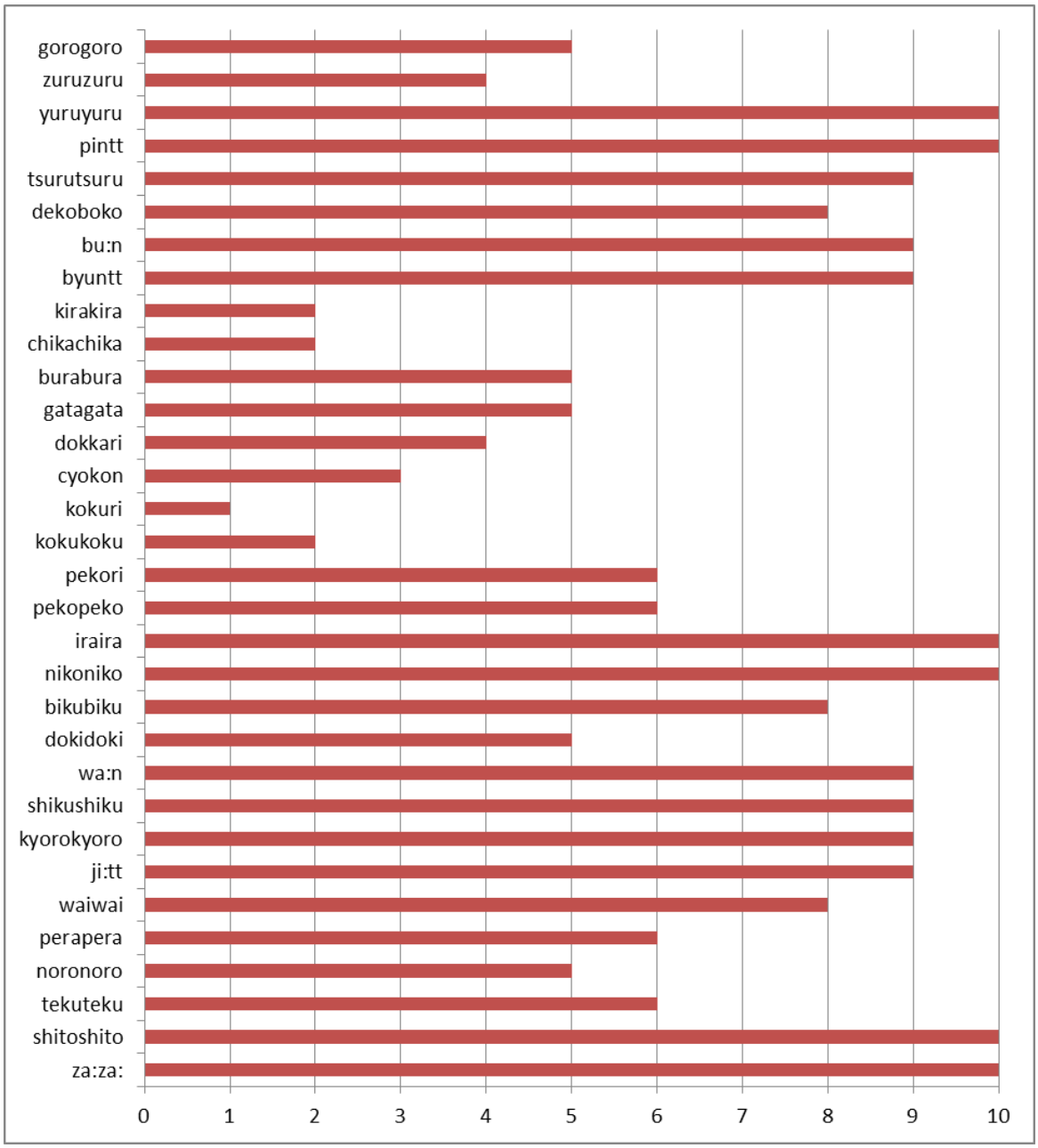

Figure 2: Accuracy of answering correct meanings of 32 words after learning from Maeda et al. (2015). X-axis represents the number of participants who answered correctly.

The most correctly answered words include “yuruyuru” ‘loosely tightened’ and “pintt” ‘well tightened’, “iraira” ‘to be irritated’ and “nikoniko” ‘to smile’, “kyorokyoro” ‘look around restlessly’ and “ji:tt” ‘to stare steadily’, “wa:n” ‘to cry loudly’ and “shikushiku” ‘to whimper’,

and “shitoshito” ‘raining quietly’ and “za:za:” ‘raining heavily’. All of them express either different degrees of an action (e.g. crying and raining) or opposite states/actions of the subject. Therefore, Maeda et al. (2015) concluded that it helps learners to capture the meanings of words when two words that have opposite degrees/manners of action/states are presented together.

The least correctly answered words include “kokukoku” ‘to nod repeatedly’ and “kokuri” ‘to nod once’ which share the same two-mora stem “koku”. 8 out of 10 participants incorrectly answered the meaning of “kokukoku” and “kokuri”. This indicates that it was hard for learners to capture the effect of reduplication which codes the number of times of the movement/action. The participants did not do well on distinguishing “kirakira” ‘to shine brightly’ and “chikachika” ‘a lamp turning on and off’ due to the similarity in manners of the same action which is ‘to shine’.

The participants who had lived in Japan for more than 6 years had better understanding and higher accuracy than those who lived in Japan for less than 4 years. The 6 participants who came to correctly understand more than 10 new words had lived in Japan for more than 6 years. Thus, Maeda et al. (2015) concluded that the digital picture book system is effective for these advanced L2 learners of Japanese to learn Japanese onomatopoeias, especially for learners who have more exposure to Japanese and Japanese culture than those who have less exposure to Japanese.

This study (Maeda et al., 2015) included Chinese-speaking learners of Japanese as

participants. Chinese has a large numbers of onomatopoeias. Maeda et al. (2015) conducted an additional study which tested a Vietnamese-speaking and a French-speaking learner of Japanese, language with few mimetics. The Vietnamese participant had known 22 words out of 32 words before the learning task, and came to correctly understand 26 words after using the system. The French participant had known 5 words out of 32 words before learning, and came to correctly understand 17 words after using the system. Based on these data, Maeda et al. (2015) suggested that this picture book system is effective on learners regardless of their first language.

Maeda et al. (2015) provided evidence that learning materials which (i) have animated pictures, (ii) allow learners to interactively learn words, and (iii) introduce two onomatopoeias together with related meanings, are effective for learning L2 mimetics and sound words regardless of learners' L1 background.

Yang, Hashimoto, Li, and Li (2015) examined different learning methods to improve the efficiency of learning Japanese onomatopoeias using both explicit and implicit nuance. Yang et al. (2015) define explicit nuance as a dictionary-based definition of onomatopoeias and implicit nuance as connotative meanings of onomatopoeias. For example, a mimetic word "tokotoko" is defined as 'walking quickly with small steps' (explicit nuance) in a dictionary ("Usage Guide to Japanese Onomatopoeias", 2009), but some Japanese native speakers use "tokotoko" when they want to add cuteness (implicit nuance) to the movement as when a little puppy is walking quickly

with small steps.

Yang et al. (2015) examined whether a nonsense word creation task could be effective. Yang et al. (2015) hypothesized that, in order to acquire the implicit nuance of onomatopoeias, not only knowing what each onomatopoeia means (dictionary-based definition) but also knowing that onomatopoeias are also productive is important. For Yang et al. (2015), creating novel onomatopoeias following provided rules provided as input and then receiving feedback on their novel creation from native Japanese speakers might help learners acquire both explicit and implicit nuances of onomatopoeias.

To test this, Yang et al. (2015) had two subject groups. One was an experimental group who received the knowledge of morphological rules (input), did a non-word creation task (output), and then received feedback. The other was a control group who received the knowledge of morphological rules (input), did an appropriateness assessment task in which the subjects were asked to rate the appropriateness of given onomatopoeias in given contexts, and then received feedback.

Participants were 36 Chinese-speaking learners of Japanese who were graduate students at a Japanese university. All of them had very high proficiency (passed the highest level of official Japanese-Language Proficiency Test) and had no difficulty in reading or writing Japanese. The participants first took a pre-test which assessed their knowledge of onomatopoeias by asking them

to judge the naturalness of sentences which contained onomatopoeias. 6 participants correctly answered 16 questions out of 18 questions; therefore those participants were eliminated from the study. The rest of 30 participants (6 male, 24 female) were divided into the two groups, experimental group and control group, equalizing their knowledge of onomatopoeias.

The experiment consisted of three parts. First, all participants were given a sheet of paper which lists four morphological rules representing the explicit nuance of onomatopoeias. The participants studied the rules for 15 minutes. The four rules were: (i) reduplication indicates that the action is consecutive, (ii) gemination indicates that the action/state is momentary, (iii) the voicing of consonants expresses bigness, loudness, harshness, and gives negative impression, and (iv) the consonant /s/ gives impression of smoothness on words such as in “sawasawa” ‘sound of soft wind’ and “subesube” ‘soft smooth skin’.

Second, the participants in the experimental group were asked to create novel onomatopoeias following the rules provided in questions. A question included a sentence with a blank in which the participants put their own creation according to the “meaning/nuance” and “rule” provided. Figure 3 shows an example of a question.

Please create an onomatopoeia which satisfies the nuance/meaning and rule provided below. Please make 10 onomatopoeias for each sentence.

Sentence 1: Big drops of rain falls (_____)ly on the roof.

Nuance/meaning: Multiple drops of liquid scatter and hit something consecutively.

Rule: Use reduplication and voicing of consonants

Figure 3: Example question of the creation task (experimental group) from Yang et al. (2015)

Once the participants created a novel onomatopoeia and typed it in the blank, a database gave them feedback as to how suitable the created word is on a scale of 1 to 5 (1: not suitable, 5: suitable). The database was created by Yang et al. (2015). They asked Japanese native speakers to judge the appropriateness of 1410 non-words (1280 non-words satisfied the reduplication and voicing rules and 130 non-words satisfied the gemination and /s/ rules) that follow either one or two of the four rules on a scale of 1 to 5 (1: not suitable, 5: suitable) for each sentence. For example, Japanese native speakers gave a rating of 5 (suitable) to a created novel word “barabara” but a rating of 1 (not-suitable) to a created novel word “zarazara” for the example sentence in Figure 5.

The control group did an assessment task in which the participants were asked to judge the appropriateness of a given onomatopoeia on a scale of 1 to 5 (1: not suitable, 5: suitable) as shown in Figure 4. Once they rated the appropriateness for each onomatopoeia, the database gave them feedback as to how Japanese native speakers judged the novel onomatopoeia.

Please rate the appropriateness of each onomatopoeia according to the nuance/meaning and rule provided below.

1: not suitable
2: not very suitable
3: neither suitable nor not suitable
4: relatively suitable
5: suitable

Nuance/meaning: Multiple drops of liquid scatter and hit something consecutively.
Rule: Use reduplication and voicing of consonants

Onomatopoeia 1: Big drops of rain falls “zawazawa” on the roof.
Onomatopoeia 2: Big droops of rain falls “parapara” on the roof.
:
:

Figure 4: Example question of the assessment task (control group) from Yang et al. (2015)

After the creation/assessment task, the participants took a post-test which was the same test format as the pre-test but with different sentences and onomatopoeias.

The results showed that only participants in the non-word creation group improved their understanding of onomatopoetic nuances while those in the assessment group did not. The results showed that the proposed method has a significant effect for learning onomatopoeia for non-native speakers. For Yang et al. (2015), the creation process was the key to help for non-native speakers.

It should be stated that while this is an effective methodology, the stimuli used were non-words. Also, Yang et al. (2015)’s participants were all L1 Chinese-speaking and were very advanced learners of Japanese who were graduate students in Japanese universities. As shown in

Maeda et al. (2015), the effectiveness of the learning might differ depending on the learners' proficiency. It is important to also note that for both Yang et al. (2015) and Maeda et al. (2015), the participants were advanced Chinese learners of Japanese, a language with a large mimetic word vocabulary. Testing a population of English-speaking learners of Japanese who vary in their L2 proficiency will contribute to developing teaching materials for L2 learners who are not familiar with mimetic words in their L1.

Chapter 4: Experiment: Learning Japanese Mimetics

The purpose of the current study is to examine whether teaching Japanese mimetics by explicitly identifying phonological/morphological rules helps English-speaking learners of Japanese remember mimetics as well as helps them generalize these rules to newly encountered mimetics. The present study contrasted two groups of learners to investigate the learning process. One group explicitly learned the phonological rules when they learned the mimetics (Experimental group) while the Control group learned the same mimetics without explicit identification of the phonological rules. Difference in learning accuracy between the Experimental group and Control group would suggest that learning phonological/morphological rules affects mimetics word acquisition; if the Experimental group performs better than the Control group, it would suggest that explicit learning of the rules facilitates learning mimetics.

Three phonological/morphological rules that often occur in mimetics were examined. The three phonological/morphological rules are (i) voicing, (ii) gemination, and (iii) reduplication. In Japanese mimetics, words with voiced sounds often express largeness, heaviness, roughness, and aggressiveness of the subject (22a,b), whereas words with voiceless sounds often express smallness, lightness, smoothness, and quickness (23a,b). By using mimetics, one can tell whether the suitcase is big/heavy or small/light without the explicit addition of an adjective as in (22b) and (23b). That is, the adjectives ‘big’ and ‘small’ in the examples (22a) and (23a) are optional

since the mimetics convey the description (big or small) of the suitcase.

(22) a. o :ki: su:tsuke:su-o gorogoro hipparu
big suitcase-ACC mimetics pull
'I pull a big suitcase'

b. su:tsuke:su-o gorogoro hipparu
suitcase-ACC mimetic pull
'I pull a big/heavy suitcase'

(23) a. chi:sai s u:tsuke:su-o korokoro hipparu
small suitcase-ACC mimetic pull
'I pull a small suitcase'

b. su:tsuke:su-o korokoro hipparu
suitcase-ACC mimetic pull
'I pull a small/light suitcase'

Gemination expresses that the movement/action is quick and instant, or the change of state is quick and occurs at one point (24). Mimetics that end with a geminate are often accompanied by the complementizer *to* when used as adverbs.

(24) totsuzen neko-ga michi-o yokogitte dokit-to-shi-ta
suddenly cat-NOM road-ACC cross mimetic-COMP-do-PAST
'Suddenly a cat crossed the road and my heart throbbed instantly'

Reduplication expresses that the movement/action is repeated continuously (25a), while mimetics that end with –ri or –n express that the movement/action took place once (25b). Mimetics that end with –ri and –n are often accompanied by the complementizer *to* when used as

adverbs.

(25) a. bareri:na-ga kurukuru mawat-ta
ballerina-NOM mimetic spin-PAST
'Ballerina spun many times/continuously'

b. bareri:na-ga kururi-to mawat-ta
ballerina-NOM mimetic-COMP spin-PAST
'Ballerina spun once'

The present study thus examined whether explicitly teaching these three phonological/morphological rules (voicing, gemination, reduplication) helps learners acquire mimetics.

Moreover, by including both a Posttest and a Delayed Posttest, long-term retention of mimetic knowledge was investigated to determine if these learning procedures could result in long-term benefits for retaining knowledge of mimetic words. The Posttest was conducted right after the Learning Session and the Delayed Posttest was conducted approximately 4 weeks later.

Finally, the present study examined whether L2 proficiency of the learners affects the learning. The current study had 33 English-speaking learners who varied in their proficiency of Japanese. Notably, English, unlike Chinese, does not have an extensive set of mimetics. Recall that Maeda et al. (2015) and Yang et al. (2015) tested fairly advanced learners of Japanese whose L1 was Chinese, a language also with extensive mimetic vocabulary. The present experiment examined whether the present learning procedures can be beneficial for Learners, at a variety of

proficiency levels, whose L1 doesn't have a significant mimetic vocabulary. Comparing the Pretest and Posttest performance for Learners at different proficiency levels will show whether proficiency matters in learning mimetics in general and whether learning phonological/morphological rules is effective in learning mimetics across proficiency levels.

The current study investigated the following questions: (i) whether teaching mimetics with a picture and a context along with a verbal description helps learners acquire mimetics, (ii) whether explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) helps learners acquire mimetics, (iii) whether explicitly teaching the three phonological/morphological rules helps learners retain the knowledge gained during the learning, and finally (iv) whether learners' proficiency affects learning mimetics.

4.1. Methods

4.1.1. Participants

Participants were 33 English-speaking learners of Japanese (16 females, 17 males) who were taking 2nd-year Fall Japanese (N=10), 2nd-year Spring Japanese (N=12), 3rd-year Spring Japanese (N=9), and 4th-year Spring Japanese classes (N=2) at the University of Kansas. None of them was fluent in any languages other than English while some of them had studied other foreign languages (German, Spanish, Chinese, and Korean) besides Japanese either at high school or

college. The amount of exposure to the Japanese language among the participants varied from 1.5 years to 9 years.

Half of the participants (N=17) were provided with explicit information of the three phonological/morphological rules (Experimental group), whereas the other half (N=16) did not receive the information explicitly (Control group).

The proficiency of the participants was assessed by the year of exposure to college education in Japanese (class level) and the scores on a Japanese vocabulary quiz (vocabulary knowledge) which was created based on the vocabulary from the N3 and N4 levels of the Japanese Language Proficiency Test (JLPT).

As for the class level, the participants who were taking the 2nd-year Japanese class (N=22) were grouped as Beginning level and those who were taking either the 3rd-year or the 4th-year Japanese class were grouped as Advanced level (N=11).

The vocabulary quiz score varied from 5 to 16 out of 20. According to the vocabulary quiz score, the participants in the Control Group and the Experimental Group were divided into 2 proficiency groups, High (score 12-16) and Low (score 5-11).

All of the participants had no known hearing disorders. The participants were asked to read and sign a consent form for participating in a linguistic perception experiment beforehand. They received monetary compensation for their participation.

4.1.2. Recording

The training mimetic words and sentences were recorded on a solid-state recorder (Marantz PMD671) using a cardioid microphone (Electrovoice-N/D-767) for noise-free recording in an anechoic chamber (IAC) on Lawrence campus at University of Kansas. The words were pronounced by a female native speaker of Japanese who spoke the Tokyo dialect.

4.1.3. Stimuli

4.1.3.1. Training words

There were 32 training words which consist of 8 voiced-voiceless pairs and 8 gemination-reduplication pairs (see Table 3 and Table 4). The training words were selected from the following mimetic resources: 70 basic mimetics and onomatopoeias for learners of Japanese suggested by Mikami (2007), 92 high-frequency mimetics and onomatopoeias seen in Japanese elemental school language textbooks by Okaya (2015), and 209 mimetics and onomatopoeias introduced in a textbook “Nihongo Tango Doriru: Giongo and Gitaigo” (2013) which was specifically created for learning onomatopoeias and mimetics for learners of Japanese who intend to take the Japanese Language Proficiency Test (JLPT).

The 8 voiced-voiceless training stimulus pairs and their meanings are listed in Table 3. Within the 8 voiced-voiceless pairs, 4 of them were minimal pairs (e.g. “gorogoro”-“korokoro”)

and 4 of them were not (e.g. “dekoboko”-“tsurutsuru”). Each pair contrasts in voicing which results in expressing different degrees of the state or action. Voiced sounds tend to express bigness, heaviness, and roughness, whereas voiceless sounds tend to express smallness, lightness, and smoothness.

Voiced training words	Voiceless training words
gorogoro *a big/heavy object rolling*	korokoro *a small/light object rolling*
zarazara *rough and sandy texture*	sarasara *smooth and silky texture*
daradara *liquid dripping profusely*	taratara *liquid dripping little by little*
giragira *strong radiation (too strong)*	kirakira *weaker radiation*
ja:ja: *gushing water*	cyorocyoro *trickling water*
zawazawa *noisy; sound of people talking*	shi:n *quiet; no sound*
dekoboko *bumpy/uneven surface*	tsurutsuru *slippery/sleekly surface*
za:za: *raining heavily and loudly*	shitoshito *raining gently and quietly*

Table 3: The 8 voiced-voiceless training stimulus pairs

The 8 reduplication-gemination training stimulus pairs are listed in Table 4. Each pair contrasts in reduplication versus gemination which results in expressing different manners of the action; reduplication expresses that the action was repeated many times or done continuously, whereas gemination expresses that the action is quick and instantaneous or the change of the state

happens at one point. The gemination mimetic words were accompanied by a complementizer *to*.

Reduplication training words	Gemination training words
nikoniko *to smile continuously*	nikot-to *to smile once instantly*
iraira *to be irritated continuously*	irat-to *to be irritated at one point*
dokidoki *to throb heavily continuously*	dokit-to *to throb heavily at one point*
furafura *be unsteady on one's feet continuously; feel dizzy*	furat-to *unsteady on one's feet once/instantly*
chirachira *to peek continuously/many times*	chirat-to *to peek once quickly*
kurukuru *to turn/circle lightly/swiftly*	kurut-to *to turn/circle once quickly*
gokugoku *to drink/swallow something continuously*	gokut-to *to swallow once quickly*
zukizuki *to have throbbing pain continuously*	zukit-to *to have a throbbing pain once*

Table 4: The 8 reduplication-gemination training stimulus pairs

4.1.3.2. Pretest-Posttest words

Pretest-Posttest words included 16 trained mimetic words (words that were presented during the Learning Session) and a set of 16 untrained mimetic words (words that were not presented during Learning). The trained words were selected from the training words in Table 3 and 4. They consisted of 4 voiced-voiceless mimetic pairs and 4 reduplication-gemination mimetic pairs (Table 5). The untrained words consisted of 4 voiced-voiceless mimetic pairs and

4 reduplication-gemination mimetic pairs (Table 6).

Voiced trained words	Voiceless trained words
gorogoro *a big/heavy object rolling*	korokoro *a small/light object rolling*
zarazara *rough sandy texture*	sarasara *smooth silky texture*
ja:ja: *gushing water*	cyorocyoro *trickling water*
zawazawa *noisy; sound of people talking*	shi:n *quiet; no sound*

Reduplication trained words	Gemination trained words
nikoniko *to smile continuously*	nikot-to *to smile once instantly*
iraira *to be irritated continuously*	irat-to *to be irritated at one point*
chirachira *to peek continuously/many times*	chirat-to *to peek once quickly*
gokugoku *to drink/swallow something continuously*	gokut-to *to swallow once quickly*

Table 5: The 16 trained words used in the Pretest and Posttest

Voiced untrained words	Voiceless untrained words
dorodoro *muddy liquid*	torotoro *smooth liquid*
zuruzuru *to drag/trail something heavy; to slither*	surusuru *to drag/trail something light easily/smoothly; to glide*
dosudosu *something/someone big/heavy walking with big stride*	tokotoko *something/someone small/light walking with small stride*
geragera *to burst into laughter*	kusukusu *to giggle; to laugh quietly*

Reduplication untrained words	Gemination untrained words
pikapika *to flash repeatedly*	pikat-to *to flash once quickly*
chikuchiku *something prickles or something itchy*	chikut-to *something stings/pricks once quickly*
bikubiku *to be in fear*	bikut-to *to be startled*
jirojiro *to stare at something/one continuously*	jirot-to *to stare/glare at something/one once*

Table 6: The 16 untrained mimetic pairs used in Pretest and Posttest

4.1.4. Procedure

The overall procedure is described in Figure 5. All participants took (1) questionnaire, (2) vocabulary quiz, (3) Pretest, (4) Learning Session, (5) Posttest, and (6) Delayed Posttest.

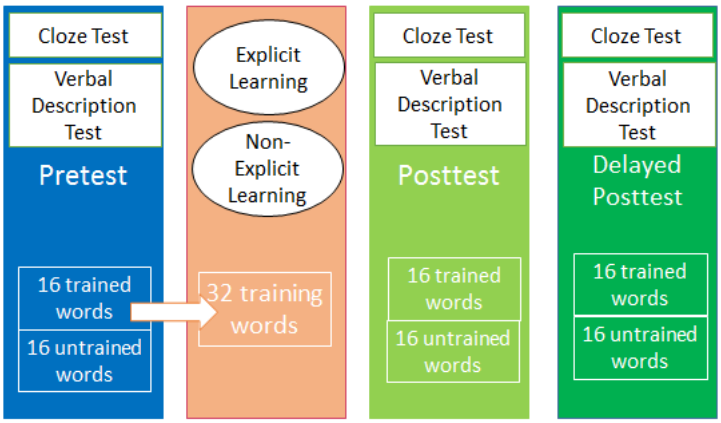

Figure 5: Experimental Design

The participants were first asked to answer a questionnaire about their language background (see Appendix B). It was confirmed that none of the English speakers were fluent in any languages that have a sizeable set of onomatopoeias such as Chinese or Korean.

After answering the questionnaire, the participants took the Japanese vocabulary test in

order to assess their proficiency in Japanese vocabulary (see Appendix C). The vocabulary test consisted of 20 questions. In each question, the participants were asked to fill in a blank with an appropriate word out of four choices. The vocabulary used in the test was selected from the N3 and N4 levels of the Japanese Language Proficiency Test (JLPT).

In the questionnaire (Appendix B), we asked the participants' class year (Japanese language class year) in addition to the years of exposure to the Japanese language, the number of manga read in Japanese, the hours of TV watched in Japanese per week, the amount of time speaking Japanese outside the classroom per week, and their age. The participant information for the Experimental Group (Table 7) and the Control Group (Table 8) is shown below.

Vocabulary Quiz scores represent the participants' score on the vocabulary quiz out of 20 questions. Vocabulary Level is coded 1 for Low vocabulary quiz scores (5-11 points) and 2 for High vocabulary quiz scores (12-16 points).

Class Year is coded for Japanese class year with 2.0 for 2nd-year Fall, 2.5 for 2nd-year Spring, 3.0 for 3rd-year Fall, 3.5 for 3rd-year Spring, 4.0 for 4th-year Fall, and 4.5 for 4th-year Spring. Class Level is coded 1 for Beginning Level (second year learners) and 2 for Advanced Level (3rd and 4th year learners). Exposure to Japanese represents the years of exposure to the Japanese language including college education. Manga represents the number of manga read in Japanese. TV in Japanese represents the hours of TV watched in Japanese per week. Talk in

Japanese represents the amount of time spent speaking Japanese outside the classroom per week.

Participant #	Vocab Quiz	Vocab Level 1: Low 2:High	Class Year	Class Level 1: Beg. 2: Adv.	Exposure (year)	Manga (vol.)	TV in JPN (hr./w)	Talk in JPN (hr./w)	Age
1	16	2	4.5	2	6	10	3	2	22
3	11	1	2.5	1	6	0	2	0	20
4	10	1	2.5	1	2	1	5	0	19
6	12	2	2.5	1	7	0	0	1	18
8	13	2	2.5	1	2	1	2	0	20
9	10	1	2.5	1	5	1	2	3	19
12	12	2	2.5	1	2	0	7	1	19
14	14	2	3.5	2	9	3	10	0	19
16	9	1	3.5	2	3	0	8	4	24
17	14	2	3.5	2	6	0	2	0	24
22	14	2	2.5	1	4	2	2	0	19
23	12	2	3.5	2	3	0	3	0	20
25	8	1	2.0	1	4	0	2	0	19
26	7	1	2.0	1	4	0	2	0.5	20
27	12	2	2.0	1	6	0	4	2	27
30	6	1	2.0	1	3	0	1	0	18
33	6	1	2.0	1	3	0	4	2	20
MEAN	**10.94**	**1.53**	**2.71**	**1.29**	**4.41**	**1.06**	**3.47**	**0.91**	**20.41**

Table 7: Participant information for the Experimental Group

Participant #	Vocab Quiz	Vocab Level 1: Low 2:High	Class Year	Class Level 1: Beg. 2: Adv.	Exposure (year)	Manga (vol.)	TV in JPN (hr./w)	Talk in JPN (hr./w)	Age
2	14	2	4.5	2	7	4	2	4	21
5	5	1	2.5	1	2	0	20	2	20
7	11	1	2.5	1	2	0	0	1	19
10	14	2	2.5	1	4	0	0	2	19
11	11	1	2.5	1	3	0	1	0	19
13	9	1	2.5	1	3	1	8	0.5	20
15	13	2	3.5	2	6	0	1	0	22
18	16	2	3.5	2	4	2	2.5	0	19
19	11	1	3.5	2	6	10	1	0	20
20	14	2	3.5	2	3	0	5	2	21
21	12	2	3.5	2	3	0	2	1	20
24	6	1	2.0	1	4	0	6	0	21
28	6	1	2.0	1	4	4	5	2	19
29	13	2	2.0	1	6	20	7	3	19
31	5	1	2.0	1	3	0	15	10	18
34	7	1	2.0	1	1.5	2	3	0	21
MEAN	**10.44**	**1.44**	**2.78**	**1.38**	**3.84**	**2.69**	**4.91**	**1.72**	**19.88**

Table 8: Participant information for the Control Group

First, we examined whether there were any differences between the Experimental Group and the Control Group for Vocabulary Quiz score and for Class Year. There was no significant difference in terms of the Vocabulary Quiz score between the Experimental Group (M=10.94; SD=2.97) and the Control Group (M=10.44; SD=3.63); t(31)=.437, p=.665. There was also no significant difference in terms of the Class Year between the Experimental Group (M=2.68; SD=0.71) and the Control Group (M=2.78; SD=0.77); t(31)=-.407, p=.687. This suggests that the

Experimental and Control groups were matched in terms of proficiency as measured by vocabulary knowledge (Vocabulary Quiz score) and years of Japanese language instruction (Class Year).

To examine whether there were any other differences across the subject groups (Experimental vs. Control), five additional factors (the years of exposure to the Japanese language, the number of manga read in Japanese, the hours of TV watched in Japanese per week, the amount of time speaking Japanese outside the classroom per week, and age) were examined. No significant differences were observed across Experimental and Control groups for these factors.

Together, these results show that the Experimental group was matched to the Control group in terms of all measures of language proficiency. Both the Experimental and Control groups had similar exposure, experience, and instruction in the Japanese language. Overall, the Experimental and Control groups were well matched in terms of language proficiency.

Across the Experimental and Control groups, participants were also evaluated based on proficiency levels, specifically Class Level (Beginning versus Advanced) as well as Vocabulary Quiz score (Low versus High). We examined whether there were differences between the Beginning level versus the Advanced level participants or between the Low and the High Vocabulary Quiz score participants in terms of the Vocabulary quiz score, the Class Year (Japanese language class year), or the five additional factors (the years of exposure to the Japanese language,

the number of manga read in Japanese, the hours of TV watched in Japanese per week, the amount of time speaking Japanese outside the classroom per week, and age). We expected to observe differences across the Beginning and Advanced levels and across the Low and High vocabulary levels in terms of the collected measures of language proficiency.

For Beginning and Advanced participants, we examined whether there were any differences in terms of the Vocabulary Quiz score, the Class Year (Japanese language class year), and the five additional factors (the years of exposure to the Japanese language, the number of manga read in Japanese, the hours of TV watched in Japanese per week, the amount of time speaking Japanese outside the classroom per week, and age) (see Table 9). We expected to observe differences across the Beginning and Advanced levels.

	Vocab Quiz	Class year	Exposure	Manga in JPN	TV in JPN	Talk in JPN	Age
Beginning	9.45	2.27	3.66	1.46	4.46	1.36	19.68
Advanced	13.18	3.64	5.09	2.64	3.59	1.18	21.09
significance	√	√	√				√

Table 9: Means of the Vocabulary Quiz score, the Class Year, and the five additional factors for the Beginning level and the Advanced level participants

There was a significant difference in terms of the Vocabulary Quiz score between the Beginning level (M=9.45; SD=3.05) and the Advanced level (M=13.18; SD=2.09); t(31)=-3.634, p=.001. As expected, there was a significant difference in terms of the Class Year between the Beginning level (M=2.27; SD=0.25) and the Advanced level (M=3.63; SD=0.45); t(31)=-11.136,

p<.001. As for the additional five factors, there was a significant difference in terms of the amount of exposure between the Beginning level (M=3.66; SD=1.55) and the Advanced level (M=5.09; SD=2.02); t(31)=-2.256, p=.031. There was also a significant difference in terms of age between the Beginning level (M=19.68; SD=1.84) and the Advanced level (M=21.09; SD=1.76); t(31)=-2.107, p=.043.

In sum, the Advanced level learners scored significantly higher on the vocabulary quiz, had taken more Japanese language classes, had more exposure to the Japanese language, and were older than the Beginning level learners.

For the Low and High Vocabulary score participants, we examined whether there were differences in terms of the Vocabulary Quiz score, the Class Year (Japanese language class year), and the five additional factors (the years of exposure to the Japanese language, the number of manga read in Japanese, the hours of TV watched in Japanese per week, the amount of time speaking Japanese outside the classroom per week, and age) (see Table 10). We expected to observe differences across the Low and High vocabulary levels.

	Vocab Quiz	Class year	Exposure	Manga in JPN	TV in JPN	Talk in JPN	Age
Low	8.12	2.38	3.44	1.12	5.00	1.47	19.76
High	13.44	3.09	4.88	2.63	3.28	1.13	20.56
significance	√	√	√				

Table 10: Means of the Vocabulary Quiz score, the Class Year, and the five additional factors for the Low and the High Vocabulary score participants

As expected, there was a significant difference in terms of the Vocabulary Quiz between the Low (M=8.12; SD=2.26) and the High (M=13.44; SD=1.31); t(31)=-8.194, p<.001. There was also a significant difference in terms of the Class Year between the Low (M=2.38; SD=0.49) and the High (M=3.09; SD=0.78); t(31)=-3.169, p=.003. There was also a significant difference in terms of the amount of exposure between the Low (M=3.44; SD=1.32) and the High (M=4.88; SD=2.03); t(31)=-2.420, p=.022.

In sum, the High vocabulary learners scored significantly higher on the vocabulary quiz, had taken more Japanese language classes, and had more exposure to the Japanese language than the Low vocabulary learners.

Overall, then, these data show that the Experimental group was matched to the Control group in terms of all measures of language proficiency. Moreover, these data show that the grouping of Beginning versus Advanced learners and the grouping of Low versus High vocabulary participants did reflect differences in proficiency along a number of measures.

(1) Pretest

Participants were instructed to sit at individual desks and were provided with the written Pretest. The test consisted of two parts: A Cloze Test and Verbal Description Test. The Cloze Test was a standard fill-in-the-blank test. The Verbal Description Test required selection of an

appropriate definition of a word. Instructions were first shown on the first page on both tests which were followed by two examples.

In the Cloze Test (see Appendix D), participants were asked to choose an appropriate mimetic word that fits in a sentence from 4 mimetic choices (an example question is provided in Figure 6). There were 32 questions in total in the Cloze Test. No feedback was given to the participants. The correct answer to question 1 is (b).

Question 1: この部屋は_____として、うるさいです。
"This room is _____ and loud"

a. しーん b. ざわざわ c. ずるずる d. するする
"shi:n" "zawazawa" "zuruzuru" "surusuru"

Figure 6: Example question from the Cloze Test

In the Verbal Description Test (see Appendix E), the participants were asked to choose an appropriate verbal description of a mimetic word from 4 descriptions (an example question is provided in Figure 7). There were 32 questions in total and no feedback was given to the participants. The correct answer to question 1 is (b).

Question 1: What is the meaning of a word ざわざわ "zawazawa"?

a. No sound; quiet
b. Noisy; sound of people talking
c. A big heavy object rolling
d. A small light object rolling

Figure 7: Example question from the Verbal Description Test

The participants first took the Cloze Test, submitted it to the experimenter, and then took the Verbal Description Test. The entire procedure for the Pretest took approximately 45 minutes.

(2) Learning

The Learning Session took place approximately one week after the Pretest. The participants were instructed to sit in front of a computer screen, wear headphones, and were provided with answer sheets for the confirmation questions.

(A) Experimental Group, with explicit instructions on the phonological rules

The Experimental group was instructed to learn the three phonological/morphological rules explicitly one by one. Instructions were first shown on the screen. The three phonological rules are the voicing rule, the reduplication rule, and the gemination rule.

First, the voicing rule was introduced (Appendix F). Participants learned what a contrast of voicing in Japanese is by an articulatory explanation that a voiced sound is one in which the vocal cords vibrate, and a voiceless sound is one in which they do not vibrate. For example, voicing accounts for the difference between the pair of sounds associated with the English sounds "z" and "s". An orthographic explanation was also presented that the voicing is usually indicated by the *Dakuten(゛)* in Japanese orthography. Next, sound regularities were introduced that voiced

sounds tend to express bigness, heaviness, and roughness, whereas voiceless sounds tend to express smallness, lightness, and smoothness. One practice pair of mimetics (not used in the test words) that contrasted in voicing was introduced as an example with static pictures: "gurun" *'big object rolls once'* and "kurun" *'small object rolls once'*. After learning the voicing rule, the 8 voiced-voiceless training words were introduced in pairs; for example, first the voiced mimetic and then the voiceless mimetic.

After the rule instructions, each mimetic was introduced with a verbal description, a static picture along with a sentence that contained the mimetic word. For example, the mimetic "gorogoro" was first introduced with a verbal description such as "gorogoro" means "a big heavy object is rolling". Then, a sentence containing the mimetic "a big heavy stone is rolling gorogoro" was introduced with a static picture (Figure 8). The participants listened to both word and sentence as they appeared on the screen. They were encouraged to listen to the audio as many times as they wanted by clicking the speaker symbol.

Figure 8: Example presentation of a mimetic word “gorogoro”

A confirmation question then followed immediately (on the screen) in which the participants were asked to write down the mimetic that fit in a sentence on the provided confirmation question answer sheets (Figure 9). The participants did not receive feedback.

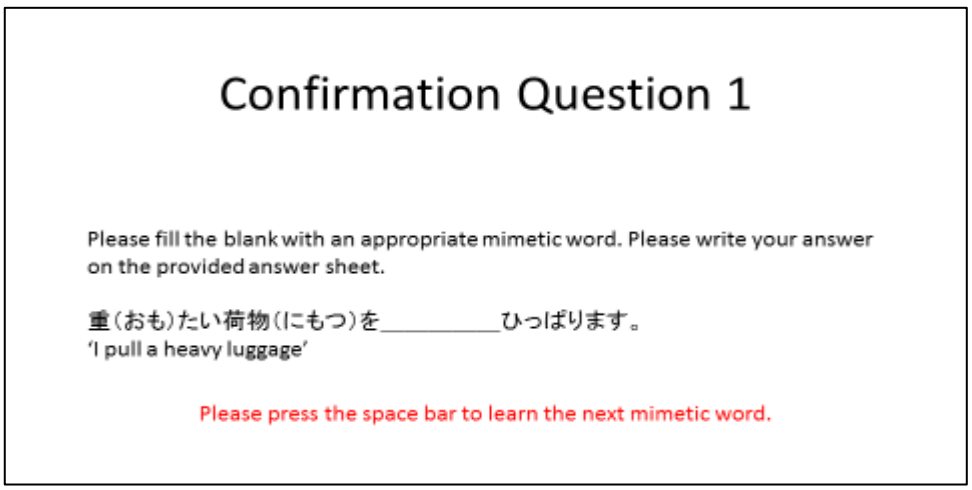

Figure 9: Example confirmation question of a mimetic word “gorogoro”

Next, the mimetic “korokoro” was introduced in the same manner (Figure 10) which was followed by a confirmation question (Figure 11).

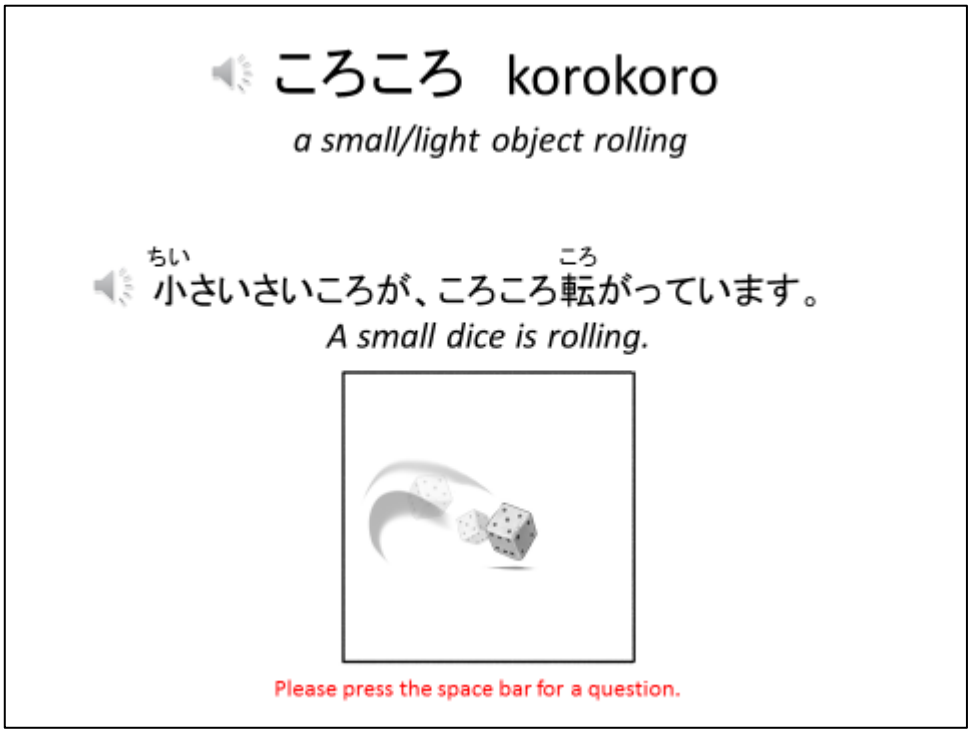

Figure 10: Example presentation of a mimetic word “korokoro”

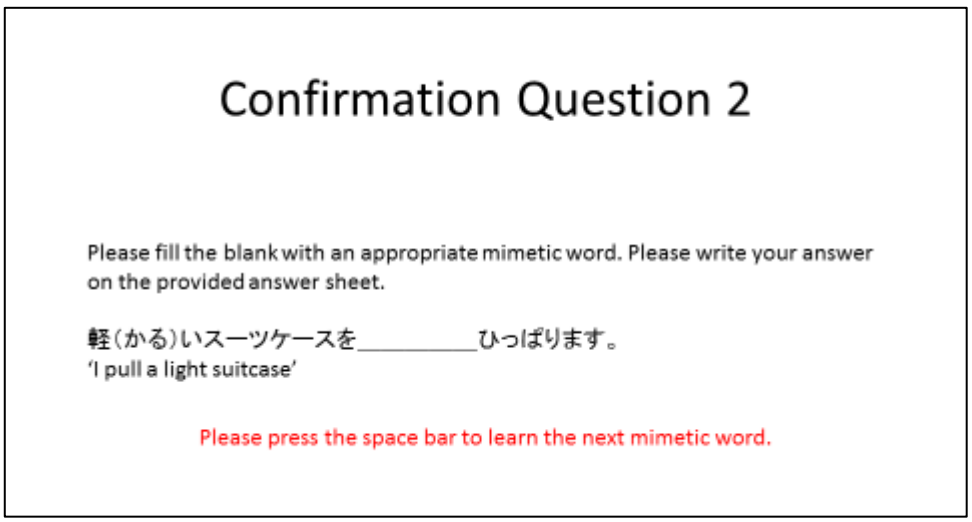

Figure 11: Example confirmation question of a mimetic word “korokoro”

After learning the 8 voicing pairs, the reduplication rule and the gemination rule were introduced.

The reduplication rule was explained as when a part of a word or even the whole word is repeated (exactly or with a slight change). Reduplication indicates that the action is repeated many times or it is used to describe the stable state of the subject (e.g. “zarazara” describes the rough texture of sand paper). A practice pair of mimetics (not used in the test words) that contrasted in reduplication was introduced with static pictures: “pyonpyon” ‘*to jump repeatedly*’ and “pyon” *‘to jump once’*.

Next, the gemination rule was explained (Appendix G). Gemination is the use of double consonants and is represented with the sokuon, a small っ (tsu) in Japanese. Gemination tends to add quickness to the action and that the action takes place once and it is instantaneous. A practice pair of mimetics (not used in the test words) for gemination was introduced with static pictures: “kiratt” *‘to shine instantaneously and quickly’* and “kirakira” *‘to shine continuously’*.

After the rule introduction, the 8 reduplication-gemination pairs were then presented in the same manner as the voicing pairs. A confirmation question then appeared after learning each word. The Experimental group learned 32 training words in the Learning Session.

(B) Control Group, without explicit instructions on the phonological rules

The Control group learned the same 32 training words. However, they did not learn the three rules. No phonological rule was explicitly explained in the instructions. Moreover, the 32 words were not introduced in contrasting pairs but each stimulus was presented word-by-word in an unordered list, with all voiced, voiceless, reduplication, and gemination words randomly presented in a mixed list. No rule was explicitly presented in the instructions.

The participants learned each mimetic word similarly (to the Experimental group) with a verbal description including audio, a static picture, and a sentence that contained the word along with audio. After every mimetic stimulus, a confirmation question was asked and no feedback was provided. Thus, the Control group learned the exact same set of words as the Experimental group but the Control group neither received explicit instructions on the three phonological rules nor learned the words in the matched voiced-voiceless and reduplication-gemination pairs.

The Learning Session took approximately 30 minutes for both the Experimental group and the Control group.

(3) Posttest

The Posttest was conducted right after the Learning Session. The Posttest was the same test as the Pretest but the ordering of the questions for the Cloze Test and Verbal Description Test were different. No feedback was provided. The participants first took the Cloze Test, submitted it

to the experimenter, and then took the Verbal Description Test. The Posttest took approximately 20 minutes.

(4) Delayed Posttest

The Delayed Posttest was conducted approximately four weeks after the Posttest. The Delayed Posttest was used to examine the retention of the word learning. The Delayed Posttest was the same test as the Pretest and the Posttest but the ordering of the questions for the Cloze Test and Verbal Description Test were different. No feedback was provided. The Delayed Posttest took approximately 20 minutes.

Chapter 5: Results

An analysis of the experiment is presented in this chapter. First, we present the Pretest-Posttest results for the Cloze Test. First, correct responses were examined. Second, additional analyses were conducted to examine correct rule application. Finally, we examined errors. Similar analyses are presented for the Verbal Description Test: Pretest-Posttest results, rule application, and error analyses. Delayed Posttest analyses are presented to examine retention of learning. Finally, participants' proficiency in Japanese is examined in terms of class level and vocabulary knowledge.

5.1. Pretest – Posttest

Pretest was first administered to all participants. The subjects then participated in the Learning Session approximately a week later. The Posttest was then conducted immediately after the Learning Session.

5.1.1. Cloze Test

For the Cloze Test, participants were asked to choose and circle an appropriate mimetic word that fits in a sentence from 4 mimetic choices. There were 32 questions in total in the Cloze Test. No feedback was given to the participants in the Cloze Test.

The first two analyses looked at correct responses. All numbers represent the average number of correct answers out of 32 questions. Figure 12 shows the average correct responses (accuracy score) for the Untrained stimuli and the Trained stimuli in the Pretest and the Untrained stimuli and Trained stimuli in the Posttest in the Control Group (left) and the Experimental Group (right). The final analysis looked at errors.

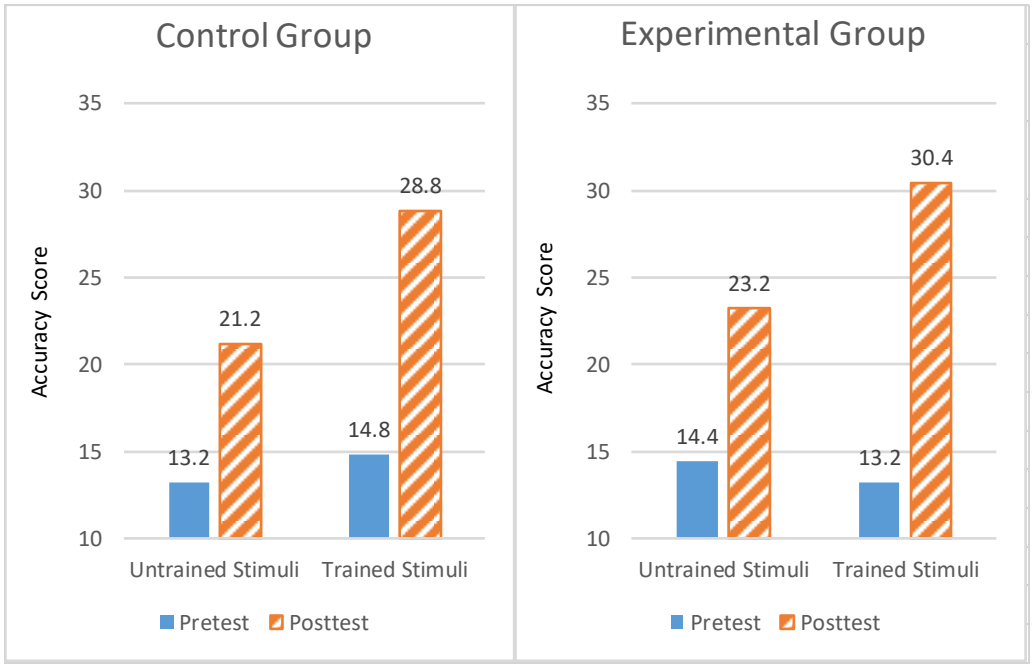

Figure 12: Average accuracy scores for the Pretest Untrained stimuli, the Posttest Untrained stimuli, the Pretest Trained stimuli, and the Posttest Trained stimuli for the Control Group (left) and the Experimental group (right) in the Cloze Test

5.1.1.1. Overall Accuracy Analysis

A three way repeated measures ANOVA (Group x Pre-Post x Stimuli) was conducted on the correct responses. There was a main effect of Pre-Post (Figure 13): $F(1,31)=297.91$, $p<0.001$. The average number of correct responses on the Pretest was 13.9 while it was 25.9 on

the Posttest across groups. The significant difference indicates that there was a significant improvement in accuracy for both participant groups, suggesting that both interventions (teaching mimetics with a picture and a context along with a verbal description) helped learners acquire mimetics.

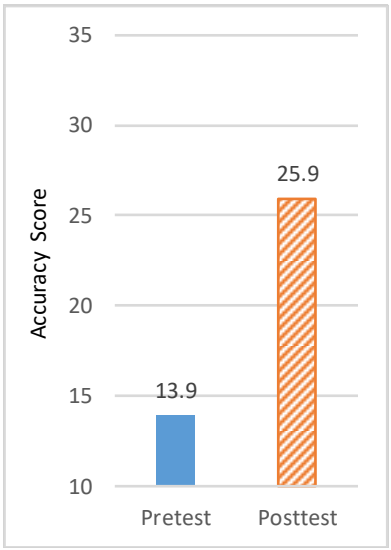

Figure 13: Overall average accuracy scores for the Pretest and the Posttest across groups in the Cloze Test

There was no significant main effect of Group: $F(1,31)=0.391$, $p=0.536$, with the accuracy for the Control Group ($M=19.5$) similar to the Experimental Group ($M=20.3$), across both Pretest and Posttest.

There was no significant Pre-Post x Group interaction: $F(1,31)=2.33$, $p=0.137$. The mean Pretest score for the Control Group was 14.0 and it was 13.8 for the Experimental Group while the mean Posttest score for the Control Group was 24.9 and it was 26.8 for the Experimental Group (Figure 14). The improvement for the Experimental Group (+13.0) was greater than that

for the Control Group (+10.9) though it did not reach significance.

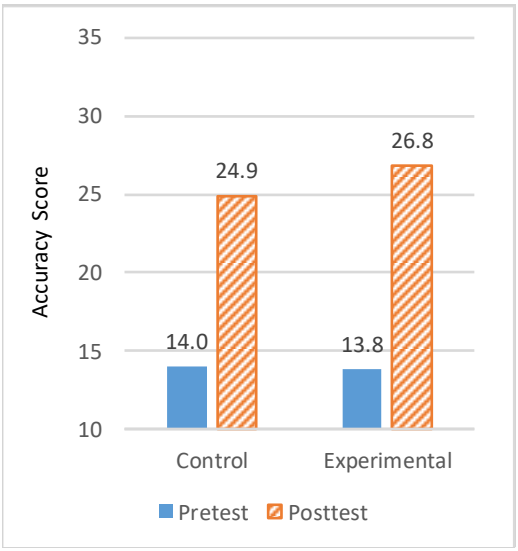

Figure 14: Overall average accuracy scores on the Pretest and the Posttest for the Control Group and the Experimental Group in the Cloze Test

There was also a main effect of Stimuli: $F(1,31)=39.59$, $p<0.001$. The overall accuracy on the Trained stimuli (M=21.8) was significantly higher than the Untrained stimuli (M=18.0) (Figure 15) which suggests that the participants performed better on words that they had been trained on.

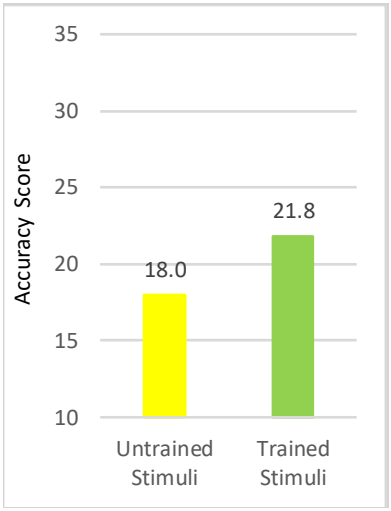

Figure 15: Overall average accuracy scores on the Untrained and the Trained stimuli across tests and participant groups in the Cloze Test

There was also an overall significant Pre-Post x Stimuli interaction: $F(1,31)=29.08$, $p<0.001$. The overall average score for the Untrained stimuli on the Posttest (M=22.2) was greater than the Pretest (M=13.8) and that for the Trained stimuli was even greater on the Posttest (M=29.6) than the Pretest (M=14.0) (Figure 16). That is, there was a greater change in accuracy for the Trained stimuli (+15.6) than for the Untrained stimuli (+8.4) after the Learning Session for both participant groups, suggesting that the Learning Session was effective in the learning of the mimetics especially those that the participants were trained on.

All other main effects and interactions were not significant.

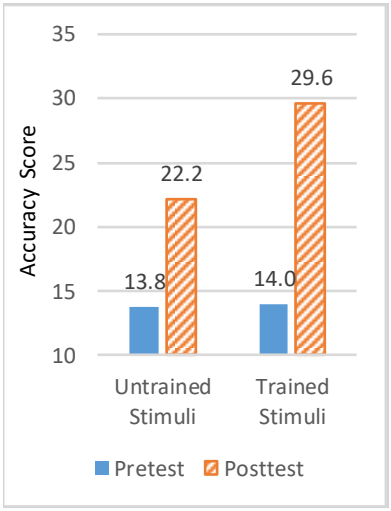

Figure 16: Overall average accuracy scores for the Untrained stimuli and the Trained stimuli on the Pretest and Posttest across groups in the Cloze Test

5.1.1.2. Rule Analysis (Voicing, Gemination, and Reduplication)

An additional analysis was conducted to look at correct rule application, that is, how often the individual rules were correctly applied for the correct responses. In this analysis, a three way repeated measures ANOVA (Group x Pre-Post x Rule) was conducted. Since there were different numbers of stimuli for the three rules, all numbers in this analysis represent the average accuracy (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

In the Cloze Test, the participants were asked to choose an appropriate mimetic word that fits in a sentence from 4 mimetic choices. For example, when the correct answer was a voiced stimulus gorogoro ‘a big heavy object rolling’, the other three options were (i) zarazara ‘rough and sandy texture’ (ii) korokoro ‘a small and light object rolling’, and (iii) sarasara ‘smooth and

silky texture'. When the correct answer was a gemination stimulus nikotto 'to smile once instantly', the other three options were (i) iratto 'to be irritated at one point', (ii) nikoniko 'to smile continuously', and (iii) iraira 'to be irritated continuously'. When the correct answer was reduplication stimulus nikoniko 'to smile continuously', the other three options were (i) iraira 'to be irritated continuously', (ii) nikotto 'to smile once instantly', and (iii) iratto 'to be irritated at one point'. In the Rule Analysis, how often each rule was correctly applied for the correct responses was examined.

There was a significant main effect of Rule: $F(2,62)=17.99$, $p<0.001$. The overall average percent accuracy for the Voicing stimuli was 59.3%, it was 58.0% for the Gemination stimuli, and it was 72.3% for the Reduplication stimuli. Pairwise Comparisons revealed that there was a significant difference in accuracy between the Voicing stimuli and the Reduplication stimuli ($p<0.001$) and between the Gemination stimuli and the Reduplication stimuli ($p<0.001$), however, no significant difference was found between the Voicing and the Gemination stimuli ($p=0.615$), suggesting that the participants across groups overall had the highest accuracy in the Reduplication stimuli among the three stimulus types and there was no significant difference between the other two types of stimuli in terms of accuracy.

There was a significant Pre-Post x Rule interaction: $F(2,62)=20.40$, $p<0.001$. The average percent accuracy for the Voicing, Gemination, and Reduplication stimuli in the Pretest

and Posttest are shown in Table 11. For the Voicing stimuli, the average percent accuracy on the Pretest was 44.3% and it improved to 74.3% on the Posttest, showing 30% improvement after the Learning Session. For the Gemination stimuli, the average percent accuracy on the Pretest was 28.9% and it improved to 87.1% on the Posttest, showing 58% improvement after the Learning Session. Finally, for the Reduplication stimuli, the average percent accuracy on the Pretest was 56.8% and it improved to 87.8% on the Posttest, showing 31% improvement after the Learning Session. Therefore, the accuracy improved the most for the Gemination stimuli.

No other significant main effects or interactions were found.

	Pretest	Posttest	Improvement
Voicing	44.3%	74.3%	+30%
Gemination	28.9%	87.1%	+58%
Reduplication	56.8%	87.8%	+31%

Table 11: Overall average percent accuracy in the three rule-based stimuli on the Pretest and Posttest across groups and their improvement in the Cloze Test

5.1.1.3. Error Analysis (Incorrect-and-rule-wise-Incorrect)

A final analysis was conducted to look at the errors. In this analysis, the incorrect answers which are also incorrect in terms of rule application (incorrect-and-rule-wise-incorrect answers) were examined. All participants' data are shown in Figure 17. Since there were different numbers of stimuli in the three rules, all numbers in this analysis represent the average percent errors (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8

Reduplication stimuli (32 stimuli in total).

In the Cloze Test, the participants were asked to choose an appropriate mimetic word that fits in a sentence from 4 mimetic choices. Out of 4 choices, one was the correct answer, one was an incorrect-but-rule-wise-correct answer, and the other two were incorrect-and-rule-wise-incorrect answers. For example, when the correct answer was a voiced stimulus *gorogoro* 'a big heavy object rolling', the other three options were (i) *zarazara* 'rough and sandy texture' as the incorrect-but-rule-wise-correct answer, as well as (ii) *korokoro* 'a small and light object rolling', and (iii) *sarasara* 'smooth and silky texture' as incorrect-and-rule-wise-incorrect answers. The option (i) *zarazara* 'rough and sandy texture' is incorrect-but-rule-wise-correct because while it is not the correct answer *gorogoro* 'a big heavy object rolling', it is a voiced stimulus, thus the option (i) is correct in terms of rule application. For the Error Analysis, only the incorrect-and-rule-wise-incorrect answers (option (ii) and (iii)) were examined.

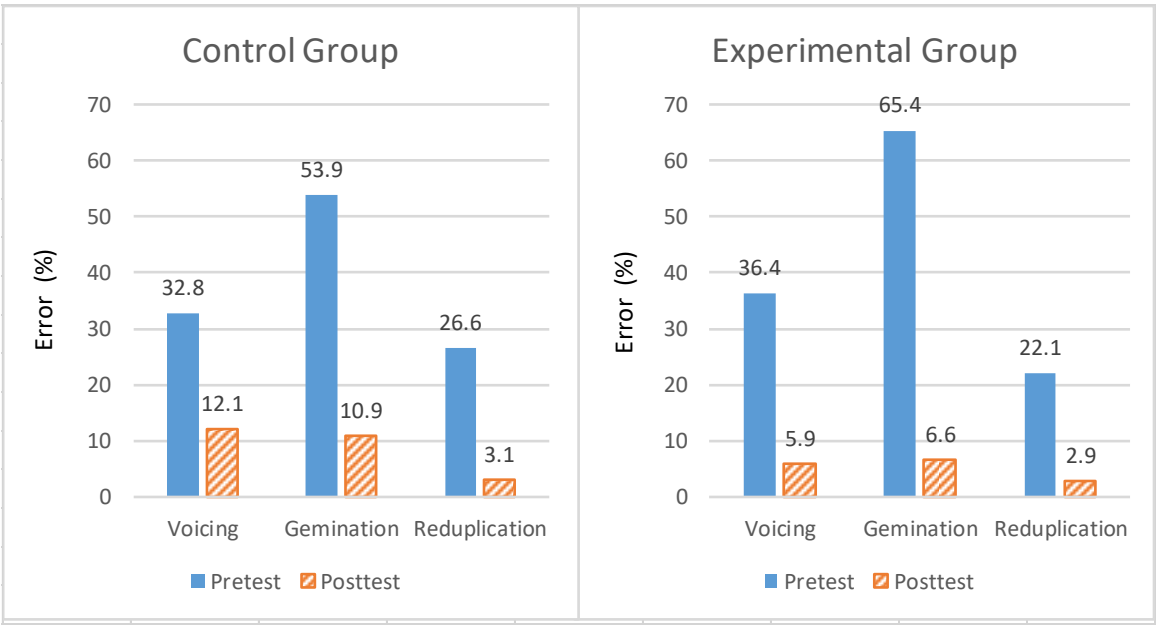

Figure 17: Average percent incorrect-and-rule-wise-incorrect answers for each rule-based stimulus types on the Pretest and Posttest in the Control Group (left) and the Experimental Group (right) in the Cloze Test

There was a significant main effect of Pre-Post: $F(1,31)=250.47$, $p<0.001$ (see Figure 18). The average percent incorrect-and-rule-wise-incorrect answers significantly decreased from the Pretest (39.5%) to the Posttest (6.9%) across both groups, indicating that there were many fewer errors in the Posttest after the Learning Session for both Control Group and the Experimental Group. This suggests that teaching mimetics with a picture and a context along with a verbal description helped the participants reduce errors, with the participants in both groups learning the mimetics with explicit rules for the Experimental Group and no explicit rules for the Control Group, and successfully applying the rules to the words.

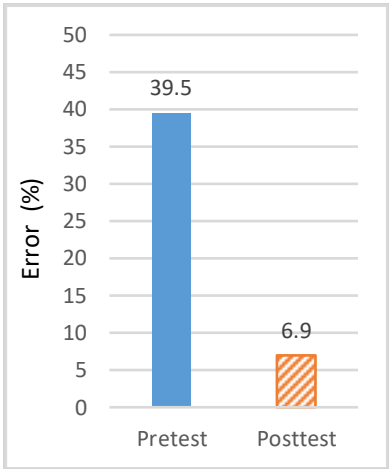

Figure 18: Overall average percent incorrect-and-rule-wise-incorrect answers on the Pretest and the Posttest across groups in the Cloze Test

There was no significant main effect of Group: $F(1,31)=0.00$, $p=0.993$, with the error rate for the Control Group ($M=23.2\%$) similar to the Experimental Group ($M=23.2\%$).

There was a trend of Pre-Post x Group interaction: $F(1,31)=2.98$, $p=0.094$ (see Figure 19). For the Control Group, the error rate fell from the Pretest (37.8%) to the Posttest (8.7%) while that of the Experimental Group fell even more from the Pretest (41.3%) to the Posttest (5.1%). The change was greater in the Experimental Group (-36.2%) than the Control Group (-29.1%). These data suggest that both the Control Group and the Experimental group had fewer incorrect-and-rule-wise-incorrect answers after the Learning Session, however, the Experimental Group showed a greater improvement than the Control Group. In other words, both groups successfully learned the rules while the participants who were taught the rules explicitly were even more successful in identifying correct rules and applying them to the mimetics.

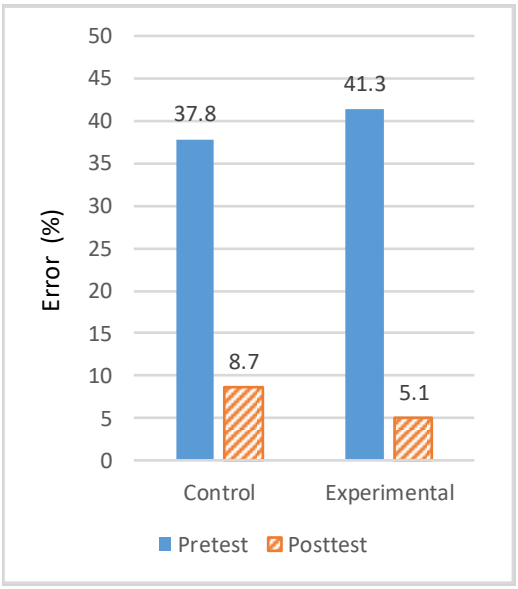

Figure 19: Average percent incorrect-and-rule-wise-incorrect answers in the Pretest and the Posttest for the Control Group and the Experimental Group in the Cloze Test

There was a significant main effect of Rule: $F(2,62)=41.42$, $p<0.001$. The average percent incorrect-and-rule-wise-incorrect answers in the Voicing stimuli was 21.8%, 34.2% in the Gemination stimuli, and 13.7% in the Reduplication stimuli. Pairwise Comparisons revealed that the difference between the Voicing and the Gemination stimuli was significant ($p<0.001$), the difference between the Gemination and the Reduplication stimuli was significant ($p<0.001$), and the difference between the Voicing and the Reduplication stimuli was also significant ($p<0.001$). Overall, the Reduplication stimuli had the fewest incorrect-and-rule-wise-incorrect answers among the three stimulus types, then the Voicing stimuli, and finally the Gemination stimuli had the most incorrect-and-rule-wise-incorrect answers.

There was a significant PrePost x Rule interaction: $F(2,62)=19.18$, $p<0.001$. The error

rate in the Voicing stimuli fell from the Pretest (34.6%) to the Posttest (9.0%), the error rate in the Gemination stimuli fell from the Pretest (59.7%) to the Posttest (8.8%), and the error rate in the Reduplication fell from the Pretest (24.3%) to the Posttest (3.0%) (Figure 20). The number of incorrect-and-rule-wise-incorrect answers in all stimulus types was greatly fell after the Learning Session in both participant groups, while the change was significantly greatest in the Gemination stimuli (-50.9%) which was followed by the Voicing stimuli (-25.6%) and the Reduplication stimuli (-21.3%). These results suggest that all three rules were successfully learned by the participants but learning the gemination rule for mimetics greatly helped the learners identify the meaning of mimetics and reduce the number of errors even more than the voicing rule or the reduplication rule.

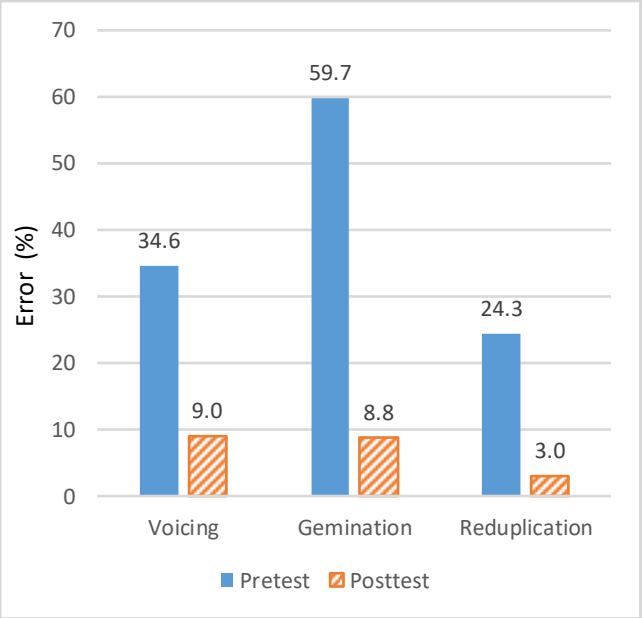

Figure 20: Average percent incorrect-and-rule-wise-incorrect answers in the Voicing stimuli, the Gemination stimuli, and the Reduplication stimuli on the Pretest and the Posttest across groups

in the Cloze Test

5.1.1.4. Pre-Post Cloze Test Summary

For the Cloze Test, participants were asked to choose and circle an appropriate mimetic word that fits in a sentence from 4 mimetic choices (correct answer, incorrect-but-rule-wise-correct answer, and two incorrect-and-rule-wise-incorrect answers). There were 32 questions in total.

Analyses of both correct and incorrect responses were conducted. For the correct responses, two types of analyses were conducted to analyze the data, an Overall Accuracy Analysis and a Rule Analysis which specifically looked at successful rule application. An Error Analysis was also conducted in which incorrect-and-rule-wise-incorrect answers were examined.

For the Cloze Test, the Overall Accuracy Analysis showed that there was a significant improvement in learning mimetics after the Learning Session. This was true for both the Experimental and the Control Group. The overall average accuracy score on the Pretest was 13.9 while that on the Posttest was 25.9. This suggests that teaching mimetics with a picture and a context along with a verbal description helps learners acquire mimetics.

The Experimental Group had a greater improvement (+13) than the Control Group (+10.9) although the difference did not reach significance in the overall accuracy analysis. For the Cloze Test, this suggests that explicitly teaching the three phonological/morphological rules

(Voicing, Gemination, and Reduplication) facilitates learning mimetics, however, it was not significantly different than using no explicit rule instruction. Both the Experimental and the Control groups successfully learned the mimetics.

The overall accuracy on the Trained stimuli (21.8) was significantly higher than the Untrained stimuli (18.0). The accuracy on the Trained stimuli improved more (+15.6) than the Untrained stimuli (+8.4) after the Learning Session across groups. These results suggest that all participants did better on words that they had been trained on. Moreover, the Learning Session helped the participants learn the mimetic words in both Control Group and the Experimental Group.

As for the specific Rule application results, the participants overall had the highest accuracy in the Reduplication stimuli among the three rule-based stimulus types (Voicing stimuli 59.3%, Gemination stimuli 58.0%, and Reduplication stimuli 72.3%). The accuracy improved over 30% after the Learning Session for all stimulus types with the accuracy improving the most in the Gemination stimuli (+58.2%) across groups.

The Error Analysis revealed that while there were significantly fewer incorrect-and-rule-wise-incorrect answers (that is, fewer errors) after the Learning Session for both participant groups, the Experimental Group showed greater improvement. The overall average percent incorrect-and-rule-wise-incorrect answers on the Pretest was 39.5% while it dropped to 6.9% on

the Posttest. This result suggests that both the Control and Experimental Group successfully learned the three rules which led to fewer errors on the rule application after the Learning Session. Additionally, the error rate fell from 37.8% to 8.7% in the Control Group and it fell from 41.3% to 5.1% in the Experimental Group. While both participant groups had significantly fewer errors after the Learning Session, the change was greater (i.e., fewer errors) in the Experimental Group (-36.2%) than the Control Group (-29.1%). This result indicates that the Experimental Group who explicitly learned the rules was even more successful in rule identification and application than the Control Group who were not explicitly taught the rules.

The analysis of the errors indicates that there was a difference between the Experimental and Control groups in terms of successful application of the rules. The analysis of the correct responses supports this conclusion. The Experimental Group was even more successful than the Control Group in rule application, that is, explicit learning helped learners acquire the mimetics.

The Error Analysis also revealed that there was a significant difference in the number of incorrect-and-rule-wise-incorrect answers among the three stimulus types. The Gemination stimuli had the highest rate of errors (34.2%) followed by the Voicing stimuli (21.8%) and the Reduplication stimuli (13.7%). This was due to the higher error rate in the Gemination on the Pretest (59.7%) compared to the Voicing stimuli (34.6%) and the Reduplication stimuli (24.3%).

The error rate in the Voicing stimuli fell from 34.6% to 9.0%, it fell from 59.7% to 8.8%

in the Gemination stimuli, and it fell from 24.3 % to 3.0% in the Redulication stimuli. While the Gemination stimuli overall had the highest rate of error across groups, the Gemination stimuli had the greatest improvement (-50.9%) among the three stimulus types. These results suggest that all three rules were successfully learned by the learners in both participant groups while knowing the gemination rule made the greatest change in correct rule identification and application.

5.1.2. Verbal Description Test

In the Verbal Description Test, the participants were asked to choose an appropriate verbal description of a mimetic word from 4 description options. There were 32 questions in total and no feedback was given to the participants.

The first two analyses examined correct responses. All numbers represent the average number of correct answers out of 32 questions. Figure 21 shows the average correct responses (accuracy score) for the Untrained stimuli and the Trained stimuli in the Pretest and the Untrained stimuli and Trained stimuli in the Posttest in the Control Group (left) and the Experimental Group (right). The final analysis looked at errors.

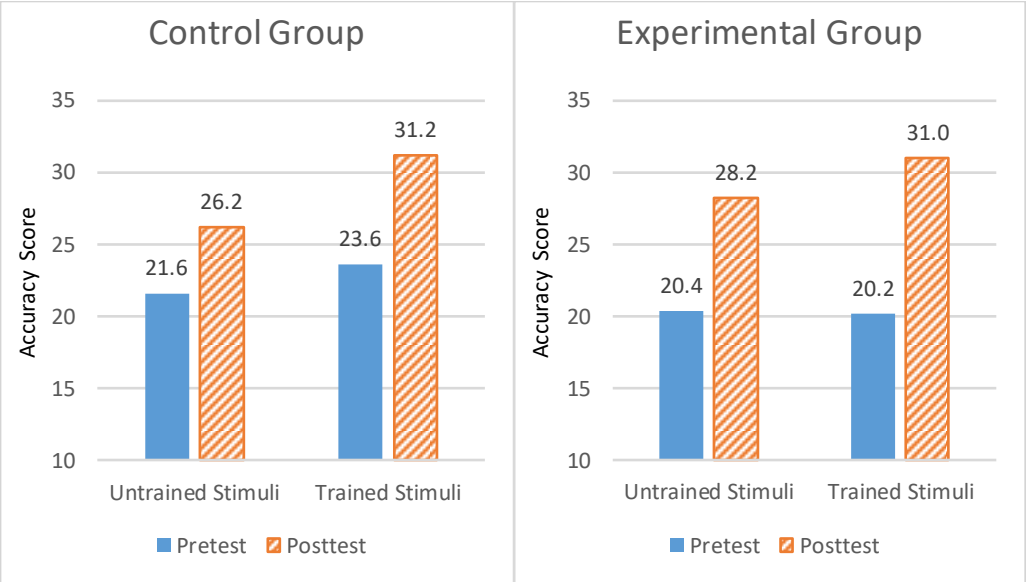

Figure 21: Average accuracy scores for the Pretest Untrained stimuli, the Posttest Untrained stimuli, the Pretest Trained stimuli, and the Posttest Trained stimuli for the Control Group (left) and the Experimental group (right) in the Verbal Description Test

5.1.2.1. Overall Accuracy Analysis

A three way repeated measures ANOVA (Group x Pre-Post x Stimuli) was conducted on the correct responses. There was a main effect of Pre-Post (Figure 22): $F(1,31)=90.91$, $p<0.001$. The average number of correct responses on the Pretest was 21.4 while it was 29.2 on the Posttest across groups. The difference was significant which indicates that there was a significant improvement in accuracy for both participant groups, suggesting that both interventions (teaching mimetics with a picture and a context along with a verbal description) helped learners acquire mimetics.

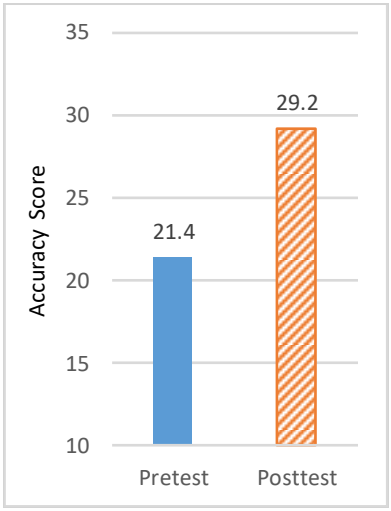

Figure 22: Overall average accuracy scores for the Pretest and the Posttest across groups in the Verbal Description Test

There was no significant main effect of Group: $F(1,31)=0.298$, $p=0.589$, with the accuracy for the Control Group ($M=25.6$) similar to the Experimental Group ($M=25.0$), across both Pretest and Posttest.

However, there was a significant Pre-Post x Group interaction: $F(1,31)=4.26$, $p=.048$. The average accuracy score on the Posttest ($M=28.6$) was higher than the Pretest ($M=22.6$) for the Control Group while that on the Posttest ($M=29.6$) was even higher than the Pretest ($M=20.2$) for the Experimental Group (Figure 23). That is, the improvement was significantly greater in the Experimental Group (+9.4) than the Control Group (+6.0) after the Learning Session. These results suggest that while both Control Group and the Experimental Group showed improvement in accuracy after the Learning Session, the Experimental Group showed a greater improvement than the Control Group. In other words, learning mimetics (with explicit rules or without explicit

rules) with a picture and a context along with a verbal description helped learners acquire mimetics, but those who were explicitly taught the rules were even more successful in word learning.

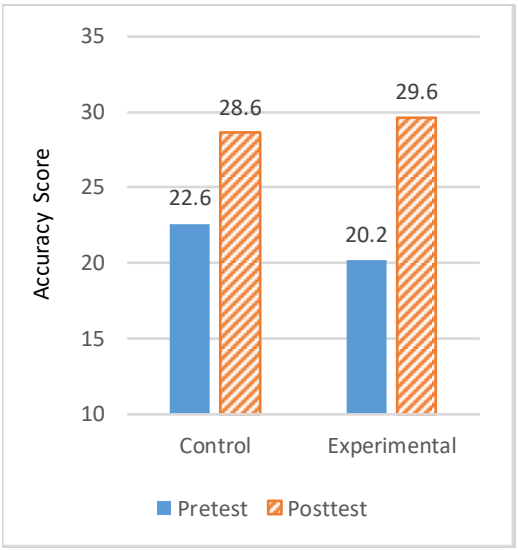

Figure 23: Overall average accuracy scores on the Pretest and the Posttest for the Control Group and the Experimental Group in the Verbal Description Test

There was also a main effect of Stimuli: $F(1,31)=13.20$, $p<0.005$. The overall accuracy for the Trained stimuli (M=26.4) was significantly higher than for the Untrained stimuli (M=24.2) (Figure 24) which suggests that the participants in both groups performed better on words that they had been trained on.

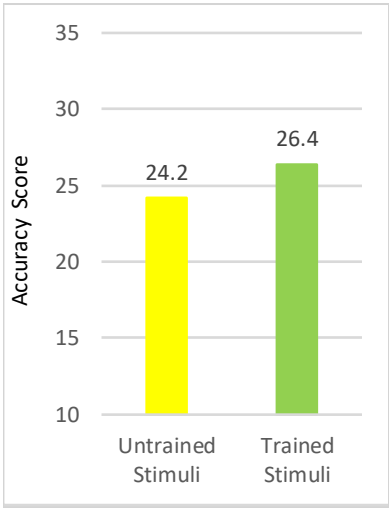

Figure 24: Overall average accuracy scores on the Untrained stimuli and the Trained stimuli across tests and participant groups in the Verbal Description Test

There was an overall significant Pre-Post x Stimuli interaction: $F(1,31)=7.20$, $p=.012$. The overall average score for the Untrained stimuli on the Posttest (M=27.2) was greater than on the Pretest (M=21.0) and that for the Trained stimuli was even greater on the Posttest (M=31.0) than the Pretest (M=21.8) (Figure 25). The improvement for the Trained stimuli (+9.2) was significantly greater than for the Untrained stimuli (+6.2). The accuracy on the Trained stimuli improved more than the Untrained stimuli after the Learning Session for both Control Group and the Experimental Group, suggesting that the Learning Session was effective in learning mimetics, especially for those stimuli that the participants were trained on.

All other main effects and interactions were not significant.

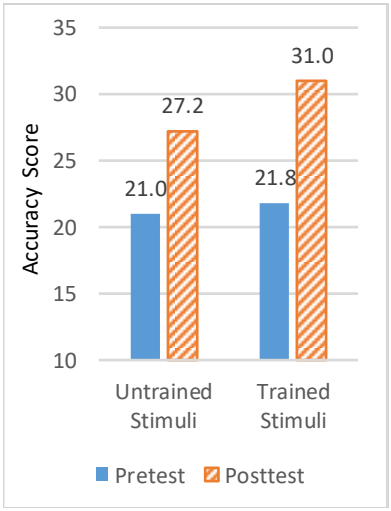

Figure 25: Overall average accuracy scores for the Untrained stimuli and the Trained stimuli on the Pretest and the Posttest across groups in the Verbal Description Test

5.1.2.2. Rule Analysis (Voicing, Gemination, and Reduplication)

An additional analysis was conducted to look at correct rule application, that is, how often the individual rules were correctly applied. In this analysis, a three way repeated measures ANOVA (Group x Pre-Post x Rule) was conducted. Since there were different numbers of stimuli for the three rules, all numbers in this analysis represent the average accuracy (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

Unlike the Cloze Test, there was not a significant main effect of Rule: $F(2,62)=1.91$, $p=0.156$ in the Verbal Description Test. The overall average percent accuracy for the Voicing stimuli was 76.8%, it was 81.7% for the Gemination stimuli, and it was 81.3% for the Reduplication stimuli.

There was not a significant Pre-Post x Rule interaction: $F(2,62)=0.06$, $p=0.947$. The average percent accuracy on the Voicing, Gemination, and Reduplication stimuli in the Pretest and Posttest are shown in Table 12. All the stimulus types improved similarly.

	Pretest	Posttest	Improvement
Voicing	65.2%	88.4%	23.2%
Gemination	69.2%	94.3%	25.1%
Reduplication	69.2%	93.5%	24.3%

Table 12: Overall average percent accuracy in the three rule-based stimuli on the Pretest and Posttest across groups and their improvement in the Verbal Description Test

There was, however, a significant Pre-Post x Group interaction: $F(1,31)=6.14$, $p=.019$. The average percent accuracy on the Posttest (M=90.2%) was higher than the Pretest (73.0%) in the Control Group while the average percentage of accuracy on the Posttest (M=93.9%) was even higher than the Pretest (M=62.6%) in the Experimental Group. The improvement was greater in the Experimental Group (+31.3%) than the Control Group (+17.2%). These results suggest that while both participant groups successfully learned the rules, the Experimental Group who explicitly learned the rules were even more successful in word learning than the Control Group who were not explicitly taught the rules.

No other significant main effects or interactions were found.

5.1.2.3. Error Analysis (Incorrect-and-rule-wise-Incorrect)

A final analysis was conducted to look at the errors. In this analysis, the incorrect-but-rule-wise-correct answers were examined. All participants' data are shown in Figure 26. Since there were different numbers of stimuli for the three rules, all numbers in this analysis represent the average percent errors (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

In the Verbal Description Test, the participants were asked to choose a verbal description out of 4 choices that describes a mimetic word. Out of 4 choices, one was the correct answer, one was incorrect-but-rule-wise-correct answer, and the other two were incorrect answers. For example, when the given mimetic word was *gorogoro* which is a Voiced stimulus, the correct verbal description is 'a big heavy object rolling'. The other three options were (i) 'rough and sandy texture' as the incorrect-but-rule-wise-correct answer because the voiced sounds also represent roughness, as well as (ii) 'a small and light object rolling' as an incorrect answer, and (iii) 'smooth and silky texture' as another incorrect answer because voiceless sounds represent smallness and smoothness. The option (i) 'rough and sandy texture' is incorrect-but-rule-wise-correct because while it is not the correct answer, it captures the effect of voicing that the voiced sounds express bigness and roughness. For the Error Analysis, only the incorrect-and-rule-wise-incorrect answers (option (ii) and (iii)) were counted.

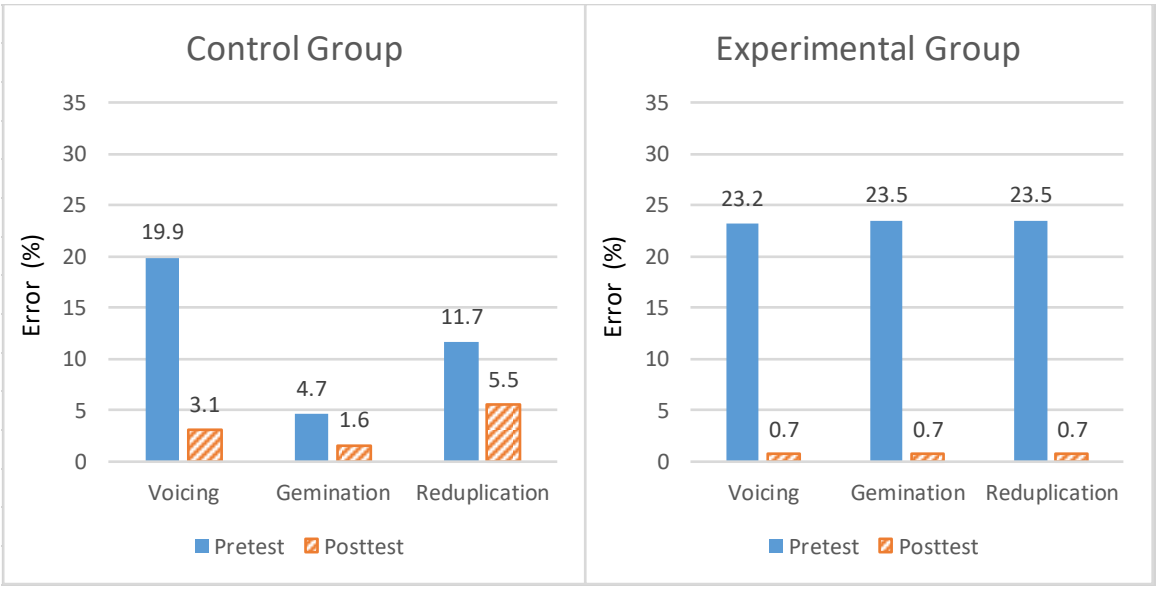

Figure 26: Average percent incorrect-and-rule-wise-incorrect answers for each rule-based stimulus types on the Pretest and Posttest in the Control Group (left) and the Experimental Group (right) in the Verbal Description Test

There was a significant main effect of Pre-Post: $F(1,31)=40.18$, $p<0.001$ (see Figure 27). The average percent incorrect-and-rule-wise-incorrect answers significantly decreased from the Pretest (17.8%) to the Posttest (2.1%) across both groups, indicating that there were significantly fewer errors in the Posttest after the Learning Session for both Control Group and the Experimental Group. This suggests that teaching mimetics with a picture and a context along with a verbal description helped the participants reduce rule-wise errors, that is, the participants in both groups learned the three morphological-phonological rules, explicitly for the Experimental Group and not explicitly for the Control Group, and they successfully learned the words.

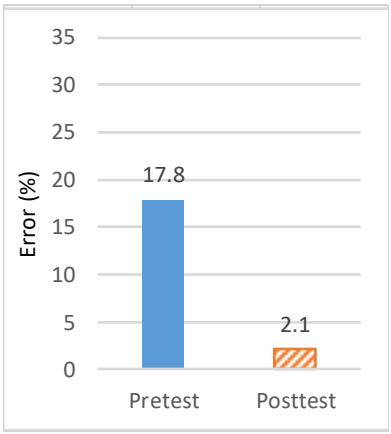

Figure 27: Overall average percent incorrect-and-rule-wise-incorrect answers on the Pretest and the Posttest across groups in the Verbal Description Test

There was no significant main effect of Group: $F(1,31)=2.66$, $p=0.113$, with the error rate for the Control Group ($M=7.7\%$) similar to the Experimental Group ($M=12.1\%$).

There was, however, a significant Pre-Post x Group interaction: $F(1,31)=7.93$, $p=.008$ (see Figure 28). For the Control Group, the error rate fell from the Pretest (12.1%) to the Posttest (3.4%) while that of the Experimental Group fell even more from the Pretest (23.4%) to the Posttest (0.7%). The change was greater in the Experimental Group (-22.7%) than the Control Group (-8.7%). These data suggest that both the Control Group and the Experimental group had fewer incorrect-and-rule-wise-incorrect answers after the Learning Session, however, the Experimental Group showed a greater improvement than the Control Group. In other words, both groups successfully learned the rules while the participants who explicitly learned the rules were even more successful in identifying correct rules and applying them to mimetics.

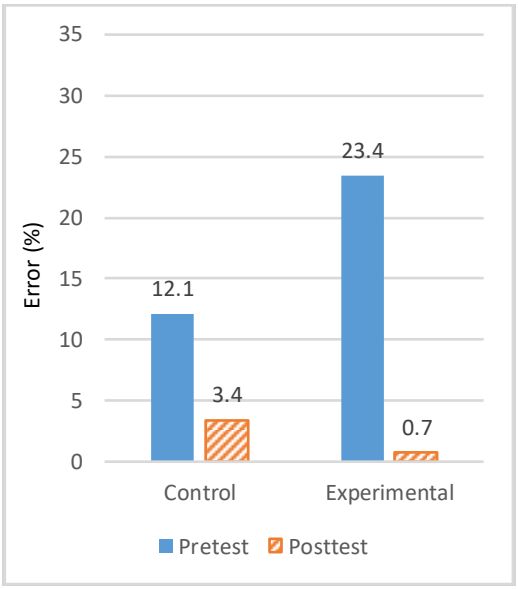

Figure 28: Average percent incorrect-and-rule-wise-incorrect answers in the Pretest and the Posttest for the Control Group and the Experimental Group in the Verbal Description Test

No other significant main effects or interactions were found.

5.1.2.4. Pre-Post Verbal Description Test Summary

For the Verbal Description Test, the participants were asked to choose an appropriate verbal description of a mimetic word from 4 description options (correct answer, incorrect-but-rule-wise-correct answer, and two incorrect-and-rule-wise-incorrect answers). There were 32 questions in total.

Analyses of correct and incorrect responses were conducted. For the correct responses, two types of analyses were conducted, an Overall Accuracy Analysis and a Rule Analysis specifically looking at rule application. An Error Analysis was also conducted in which incorrect-

and-rule-wise-incorrect answers were examined.

For the Verbal Description Test, there was a significant improvement in learning mimetics after the Learning Session for both the Control Group and the Experimental Group. The overall average accuracy score on the Pretest was 21.4 and it was 29.2 on the Posttest. More importantly, the Experimental Group showed a significantly greater improvement (+9.4) than the Control Group (+6.1). These results suggest that while teaching mimetics with a picture and a context along with a verbal description is effective for learning mimetics, explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) greatly facilitates learners in acquiring mimetics.

The overall accuracy on the Trained stimuli was significantly higher (M=26.4) than the Untrained stimuli (M=24.2). Moreover, the accuracy on the Trained stimuli improved more (+4.6) than the Untrained words (+3.1) after the Learning Session in both participant groups. These results suggest that all participants did better on words that they had been trained on, across both the Control Group and the Experimental Group.

The Rule Analysis revealed that there was a significant Pre-Post x Group interaction. The improvement was greater for the Experimental Group (+31.3%) than the Control Group (17.2%). This result supports the conclusion that the Experimental Group who explicitly learned the rules were even more successful in word learning than the Control Group who were not

explicitly taught the rules.

As for the specific Rule application, unlike in the Cloze Test, there was no significant difference in accuracy among the three stimulus rule types in the Verbal Description Test. The accuracy in all stimulus types improved over 20% after the Learning Session.

The Rule Analysis revealed that there was a significant Pre-Post x Group interaction. The improvement was greater for the Experimental Group (+31.3%) than the Control Group (17.2%). This result suggests that the Experimental Group who explicitly learned the rules were even more successful in identifying and applying the rules to words than the Control Group who was not explicitly taught the rules.

The Error Analysis revealed that there were significantly fewer incorrect-and-rule-wise-incorrect answers after the Learning Session in both participant groups. The overall average percent incorrect-and-rule-wise-incorrect answers on the Pretest was 17.8% while it fell to 2.1% on the Posttest. This result suggests that both Control and Experimental Group successfully learned the three rules which led to fewer errors for the rule application after the Learning Session.

The error rate fell from 12.1% to 3.4% in the Control Group and it fell from 23.4% to 0.7% in the Experimental Group. While both participant groups had significantly fewer errors after the Learning Session, the change was significantly greater in the Experimental Group (-22.7%) than the Control Group (-8.7%). This result indicates that the Experimental Group who

explicitly learned the rules was even more successful in rule identification and application than the Control Group who was not explicitly taught the rules.

No significant difference in the number of incorrect-and-rule-wise-incorrect answers was found among the three stimulus types in the Verbal Description Test. The error rate similarly dropped from the Pretest to Posttest across the stimulus types.

5.2. Pretest-Delayed Posttest

A Delayed Posttest was administered approximately 4 weeks after the Learning Session and the Posttest to examine whether the participants retained the knowledge they gained during the Learning Session. The same analyses (Overall Accuracy Analysis, Rule Analysis, and Error Analysis) used with the Pretest-Posttest results were conducted for both the Cloze Test and the Verbal Description Test in the Delayed Posttest.

5.2.1. Cloze Test

The First two analyses looked at correct responses. All numbers represent the average number of correct answers out of 32 questions. The final analysis looked at errors.

5.2.1.1. Overall Accuracy Analysis

A three-way repeated measures ANOVA (Group x Pre-Delayed x Stimuli) was conducted on the correct responses. There was a significant main effect of Pre-Delayed: $F(1,31)=163.40$, $p<0.001$; the average number of correct responses for the Pretest was 13.9 while it was 23.8 for the Delayed Posttest across groups. The difference was significant which indicates that there was a significant improvement in accuracy for both participant groups even 4 weeks after the Learning Session. In other words, both the Control Group and the Experimental Group retained the knowledge that they gained during the Learning Session.

There was no significant main effect of Group or Pre-Delayed x Group interaction. The mean Pretest score for the Control Group was 14.0 and it was 13.8 for the Experimental Group while the mean Delayed Posttest score for the Control Group was 22.6 and it was 24.9 for the Experimental Group. The improvement for the Experimental Group (+11.1) was greater than that for the Control Group (+8.6) though it did not reach significance.

There was a main effect of Stimuli: $F(1,31)=18.87$, $p<0.001$ with the overall accuracy on the Trained stimuli (20.4) being significantly higher than the Untrained stimuli (17.4) which suggests that the participants performed better on words that they had been trained on.

There was also an overall significant Pre-Delayed x Stimuli interaction: $F(1,31)=19.46$, $p<0.001$ with the overall average score for the Untrained stimuli on the Delayed Posttest ($M=20.8$) being greater than the Pretest ($M=13.8$) and that for the Trained stimuli was even greater on the

Delayed Posttest (M=26.6) than the Pretest (M=14.0). That is, there was a greater change in accuracy for the Trained stimuli (+12.6) than for the Untrained stimuli (+7.0) 4 weeks after the Learning Session for both participant groups, suggesting that the Learning Session was effective in acquiring the mimetics and also that the participants retained the knowledge even 4 weeks after the Learning Session, especially for those stimuli that the participants were trained on.

All other main effects and interactions were not significant.

5.2.1.2. Rule Analysis (Voicing, Gemination, and Reduplication)

A three way repeated measures ANOVA (Group x Pre-Delayed x Rule) was conducted on the correct responses. Since there were different numbers of stimuli for the three rules, all numbers in this analysis represent the average accuracy (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

There was a significant main effect of Rule: $F(2,62)=18.09$, $p<0.001$ with the overall average percent accuracy of 56.2% for the Voicing stimuli, 53.5 % for the Gemination stimuli, and 69.3% for the Reduplication stimuli. Pairwise Comparisons revealed that there was a significant difference in accuracy between the Voicing stimuli and the Reduplication stimuli ($p<0.001$) and between the Gemination stimuli and the Reduplication stimuli ($p<0.001$), however, no significant difference was found between the Voicing and the Gemination stimuli ($p=0.372$),

suggesting that the participants across groups overall had the highest accuracy in the Reduplication stimuli among the three stimulus types and there was no significant difference between the other two types of stimuli in terms of accuracy. These pattern remained the same compared to the Posttest.

There was a significant Pre-Delayed x Rule interaction: $F(2,62)=15.15$, $p<0.001$. For the Voicing stimuli, the average percent accuracy on the Pretest was 44.3% and it improved to 68.2% on the Delayed Posttest, showing 24% improvement after the Learning Session. For the Gemination stimuli, the average percent accuracy on the Pretest was 28.9% and it improved to 78.1% on the Delayed Posttest, showing 49% improvement after the Learning Session. Finally, for the Reduplication stimuli, the average percent accuracy on the Pretest was 56.8% and it improved to 81.8% on the Delayed Posttest, showing 25% improvement after the Learning Session. Therefore, the accuracy improved the most for the Gemination stimuli. This pattern remained the same compared to the Posttest.

No other significant main effects or interactions were found.

5.2.1.3. Error Analysis (Incorrect-and-rule-wise-Incorrect)

In this analysis, the incorrect answers which are also incorrect in terms of rule application (incorrect-and-rule-wise-incorrect answers) were examined. Since there were

different numbers of stimuli in the three rules, all numbers in this analysis represent the average percent errors (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

There was a significant main effect of Pre-Delayed: $F(1,31)=188.92$, $p<0.001$ with the average percent incorrect-and-rule-wise-incorrect answers significantly reduced from the Pretest (39.5%) to the Delayed Posttest (11.7%) across both groups, indicating that there were many fewer errors in the Delayed Posttest which was conducted 4 weeks after the Learning Session for both the Control Group and the Experimental Group. This suggests that teaching mimetics with a picture and a context along with a verbal description helped the participants reduce errors even 4 weeks after the Learning Session. This was true for both the Control Group, which was not explicitly taught the three phonological/morphological rules, and the Experimental Group, which learned the rules explicitly.

There was a trend of Pre-Delayed x Group interaction: $F(1,31)=3.59$, $p=.068$. For the Control Group, the error rate fell from the Pretest (37.8%) to the Delayed Posttest (13.8%) while that of the Experimental Group fell even more from the Pretest (41.3%) to the Delayed Posttest (9.7%). The change was greater in the Experimental Group (-31.6%) than the Control Group (-24.0%). These data suggest that while both the Control Group and the Experimental group had fewer incorrect-and-rule-wise-incorrect answers 4 weeks after the Learning Session, the

Experimental Group showed fewer errors than the Control Group. In other words, both groups successfully retained the knowledge of the rules while the participants who were taught the rules explicitly were even more successful in identifying correct rules and applying them to the mimetics after a 4-week interval.

There was a significant main effect of Rule: $F(2,62)=24.39$, $p<0.001$ with the average percent incorrect-and-rule-wise-incorrect answers of 23.7% for the Voicing stimuli, 36.1% for the Gemination stimuli, and 17.1% for the Reduplication stimuli. Pairwise Comparisons revealed that the difference between the Voicing and the Gemination stimuli was significant ($p<0.001$), the difference between the Gemination and the Reduplication stimuli was significant ($p<0.001$), and the difference between the Voicing and the Reduplication stimuli was also significant ($p<0.05$). Overall, the Reduplication stimuli had the fewest incorrect-and-rule-wise-incorrect answers among the three stimulus types, then the Voicing stimuli, and finally the Gemination stimuli had the most incorrect-and-rule-wise-incorrect answers. These pattern remained the same compared to the Posttest.

There was a significant Pre-Delayed x Rule interaction: $F(2,62)=23.04$, $p<0.001$ with the error rate in the Voicing stimuli fell from the Pretest (34.6%) to the Delayed Posttest (12.8%), the error rate in the Gemination stimuli fell from the Pretest (59.7%) to the Delayed Posttest (12.5%), and the error rate in the Reduplication fell from the Pretest (24.3%) to the Delayed

Posttest (9.9%). The numbers of incorrect-and-rule-wise-incorrect answers in all stimulus types was greatly reduced 4 weeks after the Learning Session in both participant groups, with the change greatest in the Gemination stimuli (-47.2%) which was followed by the Voicing stimuli (-21.8%) and the Reduplication stimuli (-14.4%). These results suggest that all three rules were successfully learned and the knowledge that the participants gained during the Learning Session was retained but learning the Gemination rule for mimetics greatly helped the learners identify the meaning of mimetics and reduce the number of errors even more than the Voicing rule or the Reduplication rule 4 weeks after the Learning Session.

5.2.1.4. Pre-Delayed Cloze Test Summary

For the Cloze Test, the results of the Overall Accuracy Analysis and Rule Analysis and the Error Analysis on the Delayed Posttest showed that the participants in both the Control Group and the Experimental Group successfully retained the knowledge that they gained during the Learning Session 4 weeks after the session. The pattern of the Experimental Group having a greater improvement than the Control Group remained the same compared to the Posttest although the difference did not reach significance in the overall accuracy analysis.

However, the Error Analysis revealed that while there were significantly fewer incorrect-and-rule-wise-incorrect answers (that is, fewer errors) after the Learning Session in both

participant groups, the change was greater (i.e., fewer errors) in the Experimental Group (-31.6%) than the Control Group (-24.0%). This result indicates that, 4 weeks after the Learning Session, the Experimental Group who explicitly learned the rules was even more successful in rule identification and application than the Control Group who was not explicitly taught the rules. That is, explicit learning helped learners not only acquire the mimetics but also retain the knowledge.

The overall accuracy on the Trained stimuli was significantly higher than the Untrained stimuli. The accuracy on the Trained stimuli improved more than the Untrained stimuli after the Learning Session across groups. These results suggest that all participants did better on words that they had been trained on. Moreover, the Learning Session helped the participants learn and retain the knowledge of the mimetic words in both Control Group and the Experimental Group.

As for the specific Rule application results from the Rule Analysis and the Error Analysis, the participants overall had the highest accuracy in the Reduplication stimuli among the three rule-based stimulus types. While the Gemination stimuli overall had the highest rate of error across groups, the Gemination stimuli also had the greatest improvement among the three stimulus types. These results suggest that all three rules were successfully learned and retained by the learners in both participant groups while knowing the gemination rule made the greatest change in the correct rule identification and application 4 weeks after the Learning Session.

5.2.2. Verbal Description Test

The first two analyses looked at correct responses. All numbers represent the average number of correct answers out of 32 questions. The final analysis examined the errors.

5.2.2.1. Overall Accuracy Analysis

A three way repeated measures ANOVA (Group x Pre-Delayed x Stimuli) was conducted on the correct responses. There was a significant main effect of Pre-Delayed: $F(1,31)=82.15$, $p<0.001$ with the average number of correct responses of 21.4 for the Pretest while it was 28.6 for the Delayed Posttest across groups. The difference was significant which indicates that there was a significant improvement in accuracy for both participant groups 4 weeks after the Learning Session, in other words, both the Control Group and the Experimental Group retained the knowledge that they gained during the Learning Session.

There was a significant Pre-Delayed x Group interaction: $F(1,31)=5.58$, $p=.025$ with the average accuracy score on the Delayed Posttest ($M=28.0$) being higher than the Pretest ($M=22.6$) for the Control Group while that on the Delayed Posttest ($M=29.2$) was even higher than the Pretest ($M=20.2$) for the Experimental Group. That is, the improvement was significantly greater in the Experimental Group (+9.0) than the Control Group (+5.4) 4 weeks after the Learning Session. These results suggest that while both Control Group and the Experimental Group showed

improvement in accuracy after the Learning Session and retained the knowledge that they gained during the Learning Session, the Experimental Group showed a greater improvement than the Control Group. In other words, learning mimetics (with either explicit rules or without explicit rules) with a picture and a context along with a verbal description helped learners not only acquire mimetics but also retain the knowledge. More importantly, those who explicitly learned the rules were even more successful in learning mimetics 4 weeks after the Learning Session.

There was a main effect of Stimuli: $F(1,31)=10.14$, $p=.003$ with the overall accuracy on the Trained stimuli ($M=26.0$) being significantly higher than the Untrained stimuli ($M=24.0$) which suggests that the participants performed better on words that they had been trained on.

There was also an overall significant Pre-Delayed x Stimuli interaction: $F(1,31)=5.25$, $p=.029$ with the overall average score for the Untrained stimuli on the Delayed Posttest ($M=27.0$) being greater than the Pretest ($M=21.0$) and that for the Trained stimuli was even greater on the Delayed Posttest ($M=30.2$) than the Pretest ($M=21.8$). That is, there was a greater change in accuracy for the Trained stimuli (+8.4) than for the Untrained stimuli (+6.0) 4 weeks after the Learning Session for both participant groups, suggesting that the Learning Session was effective in the learning of the mimetics and also that the participants retained the knowledge 4 weeks after the Learning Session, especially of those that the participants were trained on.

All other main effects and interactions were not significant.

5.2.2.2. Rule Analysis (Voicing, Gemination, and Reduplication)

A three way repeated measures ANOVA (Group x Pre-Delayed x Rule) was conducted on the correct responses. Since there were different numbers of stimuli for the three rules, all numbers in this analysis represent the average accuracy (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

Unlike on the Pre-Post analysis, there was a trend of the main effect of Rule: $F(2,62)=2.64$, $p=.079$ with the overall average percent accuracy of 75.5% for the Voicing stimuli, 81.2% for the Gemination stimuli, and 80.8% for the Reduplication stimuli. Pairwise Comparisons revealed that there was a marginally significant difference in accuracy between the Voicing stimuli and the Gemination stimuli ($p=0.088$) and between the Voicing stimuli and the Redulication stimuli ($p=0.087$), however, no significant difference was found between the Gemination and the Reduplication stimuli ($p=0.829$), suggesting that the participants across groups overall had the lowest accuracy in the Voicing stimuli among the three stimulus types and there was no difference between the other two types of stimuli in terms of accuracy.

There was a significant Pre-Delayed x Group interaction: $F(1,31)=6.62$, $p=.015$ with the Experimental Group having a greater improvement (+29.8%) than the Control Group (+15.5%) which suggests that the Experimental Group who explicitly learned the rules were more successful

in learning mimetics 4 weeks after the Learning Session than the Control Group who was not explicitly taught the rules.

No other significant main effects or interactions were found.

5.2.2.3. Error Analysis (Incorrect-and-rule-wise-Incorrect)

In this analysis, the incorrect answers which are also incorrect in terms of rule application (incorrect-and-rule-wise-incorrect answers) were examined. Since there were different numbers of stimuli in the three rules, all numbers in this analysis represent the average percent errors (%) for each stimulus type. There were 16 Voicing stimuli, 8 Gemination stimuli, and 8 Reduplication stimuli (32 stimuli in total).

There was a significant main effect of Pre-Delayed: $F(1,31)=38.68$, $p<0.001$ with the average percent incorrect-and-rule-wise-incorrect answers significantly decreased from the Pretest (17.8%) to the Delayed Posttest (2.9%) across both groups, indicating that there were many fewer errors in the Delayed Posttest which was conducted 4 weeks after the Learning Session for both the Control Group and the Experimental Group. This suggests that teaching mimetics with a picture and a context along with a verbal description helped the participants reduce errors even 4 weeks after the Learning Session. This was true for both the Control Group who was not explicitly taught the three phonological/morphological rules and the Experimental

Group who learned the rules explicitly.

There was a significant interaction of Pre-Delayed x Group interaction: $F(1,31)=9.36$, $p=.005$. For the Control Group, the error rate fell from the Pretest (12.1%) to the Delayed Posttest (4.6%) while that of the Experimental Group fell even more from the Pretest (23.4%) to the Delayed Posttest (1.2%). The change was greater in the Experimental Group (-22.2%) than the Control Group (-7.5%). These data suggest that both the Control Group and the Experimental group had fewer incorrect-and-rule-wise-incorrect answers 4 weeks after the Learning Session, however, the Experimental Group showed significantly fewer errors than the Control Group. In other words, both groups successfully retained the knowledge while the participants who were taught the rules explicitly were even more successful in identifying mimetics and correctly applying the rules.

No other significant main effects or interactions were found.

5.2.2.4. Pre-Delayed Verbal Description Test Summary

For the Verbal Description Test, the results of the Overall Accuracy Analysis, Rule Analysis, and the Error Analysis on the Delayed Posttest showed that the participants in both the Control Group and the Experimental Group successfully retained the knowledge that they gained during the Learning Session even 4 weeks after the session. The pattern of the Experimental

Group having a significantly greater improvement and significantly fewer rule-wise errors than the Control Group remained the same as the Posttest. These results suggest that while teaching mimetics with a picture and a context along with a verbal description is effective for learning and retaining the knowledge of mimetics, explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) greatly facilitates learners in acquiring and remembering mimetics.

The overall accuracy on the Trained stimuli was significantly higher than the Untrained stimuli. Moreover, the accuracy on the Trained stimuli improved more than the Untrained words 4 weeks after the Learning Session in both participant groups. These results suggest that all participants did better on words that they had been trained on, across both the Control Group and the Experimental Group.

The Rule Analysis revealed that the Experimental Group had greater improvement than the Control Group which suggests that the participants who were explicitly taught the rules were more successful in learning and remembering mimetics 4 weeks after the Learning Session than the Control Group who was not explicitly taught the rules.

As for the specific Rule application results from the Rule Analysis, the participants overall had the lowest accuracy in the Voicing stimuli among the three rule-based stimulus types. No significant difference in the number of incorrect-and-rule-wise-incorrect answers was found

among the three stimulus types in the Verbal Description Test. The error rate similarly fell from the Pretest to the Delayed Posttest across the stimulus types.

5.3. Proficiency Analyses

In this analysis, participants' proficiency in Japanese in terms of the amount of exposure to college education in Japanese language (class level) and their general vocabulary knowledge was examined.

Participants were 33 English-speaking participants (16 females, 17 males) who were taking 2nd-year Fall Japanese (N=10), 2nd-year Spring Japanese (N=12), 3rd-year Spring Japanese (N=9), and 4th-year Spring Japanese (N=2) at the University of Kansas. None of them was fluent in any languages other than English while some of them had studied other foreign languages (German, Spanish, Chinese, and Korean) besides Japanese either at high school or college.

Two analyses were conducted to examine proficiency in Japanese. One analysis was based on class level, Beginning or Advanced. The other analysis looked at proficiency by examining participants' score on a vocabulary quiz which was created based on the vocabulary from the N3 and N4 levels of the Japanese Language Proficiency Test (JLPT). According to the score, the participants were categorized as Low or High.

5.3.1. Class level Analysis

The participants were grouped into two class levels according to the Japanese language class that they were taking at the time of the experiment. 22 participants who were taking a 2nd-year Japanese course in the Fall or Spring semesters were grouped as Beginning level, while 11 participants who were taking a 3rd-year or a 4th-year Japanese course were grouped as Advanced level. In the Experimental Group, there were 12 Beginning participants and 5 Advanced participants. In the Control Group, there were 10 Beginning participants and 6 Advanced participants.

An Overall Accuracy Analysis was conducted for both the Cloze Test and the Verbal Description Test. Correct responses were analyzed. All numbers represent the average number of correct answers out of 32 questions.

5.3.1.1. Cloze Test

A three way repeated measures ANOVA (Pre-Post x Group x Class level) was conducted on the correct responses.

There was a significant main effect of Class level (Figure 29): $F(1,29)=5.53$, $p=.026$. The average number of correct responses for the Beginning level was 18.8 while it was 21.9 for the Advanced level. Overall, the Advanced level knew more mimetics than the Beginning level.

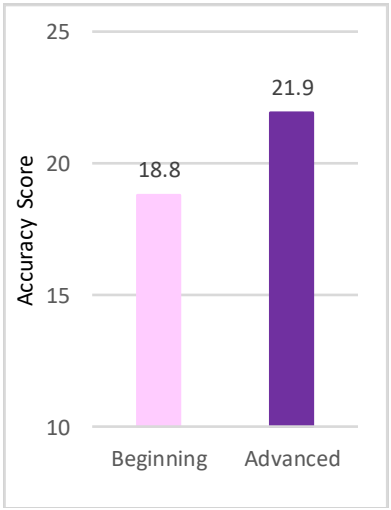

Figure 29: Overall average accuracy scores for the Beginning level and the Advanced level participants across tests and groups in the Cloze Test

There was a significant main effect of Pre-Post: $F(1,29)=270.86$, $p<0.001$, with the average accuracy score of 14.6 on the Pretest and 26.1 on the Posttest. There was a significant improvement in accuracy for both class levels across groups.

There was a significant Pre-Post x Class level interaction (Figure 30): $F(1,29)=4.952$, $p=.034$. The average number of correct responses for the Advanced level improved from 16.9 on the Pretest to 26.9 on the Posttest, while it improved even more from 12.3 on the Pretest to 25.3 on the Posttest for the Beginning level. While the performance in both proficiency levels improved after the Learning Session, the change was significantly greater for the Beginning level (+13.0) students than for the Advanced level (+10.0) students.

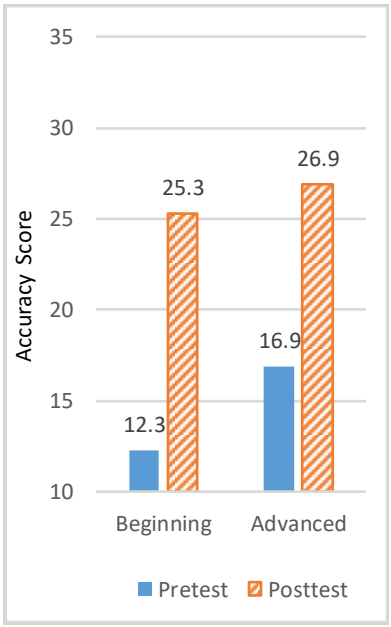

Figure 30: Overall average accuracy scores on the Pretest and the Posttest for the Beginning level and the Advanced level participants across groups in the Cloze Test

There was no significant Pre-Post x Group x Class level interaction: $F(1,29)=0.56$, $p=0.459$.

Regardless of the group (Control Group and Experimental Group), while the participants in the Advanced level overall learned more mimetics than those in the Beginning level, the improvement was greater in the Beginning level than the Advanced level.

5.3.1.2. Verbal Description Test

A three way repeated measures ANOVA (Pre-Post x Group x Class level) was conducted on the correct responses.

There was a trend of Class level (Figure 31): $F(1,29)=3.21$, $p=0.084$. The average

number of correct responses for the Beginning level was 24.5 while it was 26.9 for the Advanced level. Overall, the Advanced level knew more mimetics than the Beginning level participants.

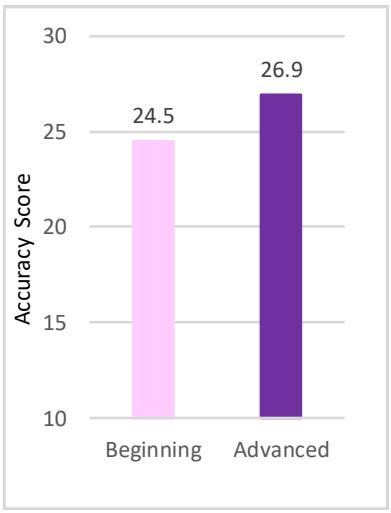

Figure 31: Overall average accuracy scores for the Beginning level and Advanced level participants across tests and groups in the Verbal Description Test

There was a significant main effect of Pre-Post: $F(1,29)=72.92$, $p<0.001$. The overall average accuracy score on the Pretest was 22.1 which improved to 29.3 on the Posttest. The improvement was significant for both class levels across group.

There was a trend for the Pre-Post x Class level interaction (Figure 32): $F(1,29)=3.32$, $p=0.079$. The average number of correct responses for the Advanced level improved from 24.1 on the Pretest to 29.8 on the Posttest, while it improved even more from 20.1 on the Pretest to 28.9 on the Posttest for the Beginning level participants. While the performance for both proficiency levels improved after the Learning Session, the change was greater for the Beginning level (+8.8) students than the Advanced level (+5.7) students.

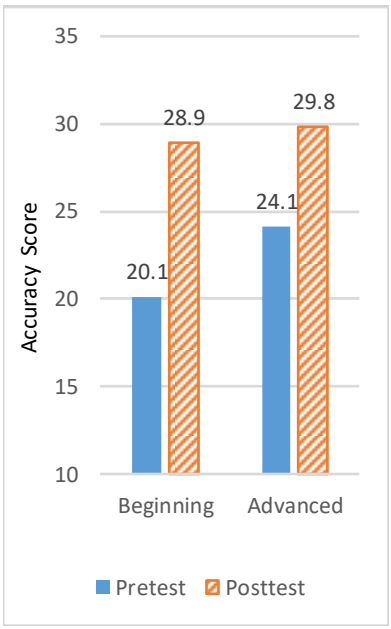

Figure 32: Overall accuracy scores on the Pretest and Posttest for the Beginning level and Advanced level participants across groups in the Verbal Description Test

There was no significant Pre-Post x Group x Class level interaction: $F(1,29)=0.01$, $p=0.997$.

Regardless of the group (Control Group and Experimental Group), while the participants in the Advanced level overall learned more mimetics than those in the Beginning level, the improvement was greater for the Beginning level participants than for the Advanced level participants.

5.3.2. Vocabulary knowledge Analysis

All participants took a Japanese vocabulary quiz which was created based on the vocabulary from the N3 and N4 levels of the Japanese Language Proficiency Test (JLPT).

The quiz score varied from 5 to 16 out of 20. According to the vocabulary quiz score, the participants were divided into 2 proficiency groups, Low (score 5-11) and High (score 12-16). There were 17 participants in the Low Vocabulary Proficiency (8 in the Experimental Group and 9 in the Control Group) and 16 participants in the High Vocabulary Proficiency (9 in the Experimental Group and 7 in the Control Group).

An Overall Accuracy Analysis was conducted for both the Cloze Test and the Verbal Description Test. Correct responses were analyzed. All numbers represent the average number of correct answers out of 32 questions.

5.3.2.1. Cloze Test

A three way repeated measures ANOVA (Pre-Post x Group x Vocabulary) was conducted on the correct responses.

There was a significant main effect of Vocabulary Proficiency (Figure 33): $F(1,29)=15.92$, $p<0.001$. The average number of correct responses for the Low Vocabulary Proficiency was 17.8 while it was 22.2 for the High Vocabulary Proficiency. Overall, the participants with High Vocabulary Proficiency scores knew more mimetics than those with Low Vocabulary Proficiency scores.

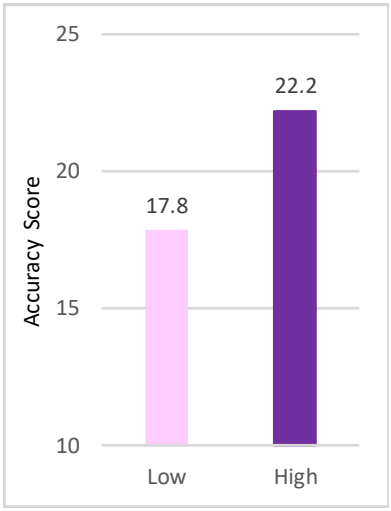

Figure 33: Overall average accuracy scores for the Low and High Vocabulary Proficiency across tests and groups in the Cloze Test

There was a significant main effect of Pre-Post: $F(1,29)=308.43$, $p<0.001$, with the average accuracy score of 14.0 on the Pretest and 26.0 on the Posttest. There was a significant improvement in accuracy in both vocabulary proficiency levels across groups.

There was a trend Pre-Post x Vocabulary interaction (Figure 34): $F(1,29)=308.43$, $p=0.069$. The average number of correct responses for the High Vocabulary Proficiency improved from 16.8 on the Pretest to 27.5 on the Posttest, while it improved even more from 11.2 on the Pretest to 24.4 on the Posttest for the Low Vocabulary Proficiency. While the performance in both vocabulary levels improved after the Learning Session, the change was greater in the participants with Low vocabulary scores (+13.2) than those with High vocabulary scores (+10.7).

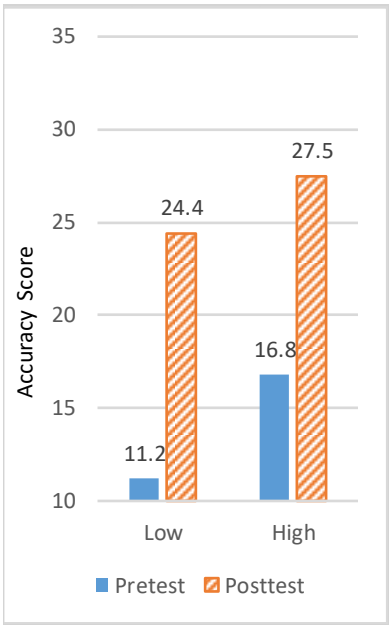

Figure 34: Overall accuracy scores on the Pretest and Posttest for the Low and the High Vocabulary Proficiency across groups in the Cloze Test

There was no significant Pre-Post x Group x Vocabulary interaction: $F(1,29)=0.01$, $p=0.915$.

Regardless of the group (Control Group and Experimental Group), while the participants with High vocabulary scores overall learned more mimetics than those with Low vocabulary scores, the improvement was greater in the Low than the High.

5.3.2.2. Verbal Description Test

A three way repeated measures ANOVA (Pre-Post x Group x Vocabulary) was conducted on the correct responses.

There was a significant main effect of Vocabulary Proficiency (Figure 35): $F(1,29)=4.23$,

p=.049. The average number of correct responses for the Low Vocabulary Proficiency was 24.1 while it was 26.7 for the High Vocabulary Proficiency. Overall, the participants with High Vocabulary Proficiency scores acquired more mimetics than those with Low Vocabulary Proficiency scores.

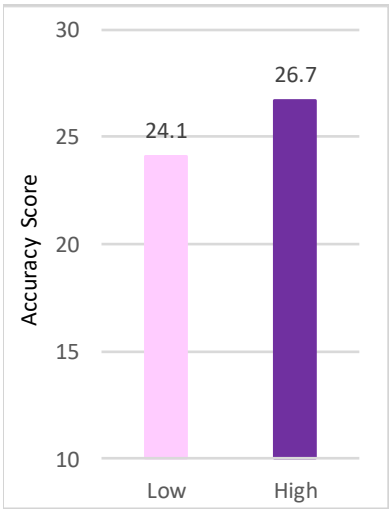

Figure 35: Overall average accuracy scores for the Low and the High Vocabulary Proficiency across tests and groups in the Verbal Description Test

There was a significant main effect of Pre-Post: $F(1,29)=88.69$, $p<0.001$, with the average accuracy score of 21.6 on the Pretest and 29.2 on the Posttest. There was a significant improvement in accuracy in both vocabulary levels across groups.

Unlike the Cloze Test, there was no significant Pre-Post x Vocabulary interaction (Figure 36): $F(1,29)=1.24$, $p=0.276$. The average number of correct responses for the High Vocabulary Proficiency improved from 23.3 on the Pretest to 30.1 on the Posttest, while it improved from 19.9 on the Pretest to 28.4 on the Posttest for the Low Vocabulary Proficiency. The performance

in both vocabulary levels improved similarly (High: +6.8, Low: +8.5) after the Learning Session.

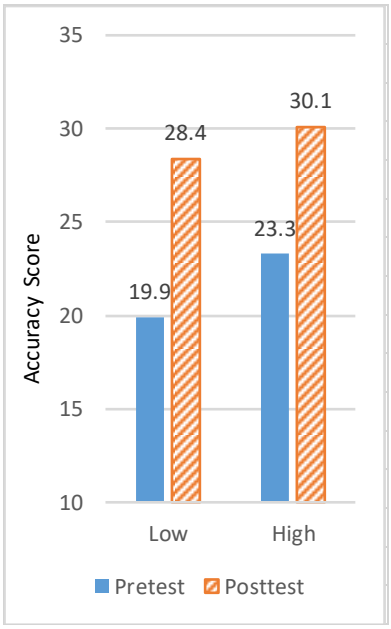

Figure 36: Overall accuracy scores on the Pretest and Posttest for the Low and the High Vocabulary Proficiency across groups in the Verbal Description Test

5.3.3. Proficiency Analyses Summary

Proficiency analyses were conducted in order to investigate whether participants' proficiency in Japanese affects the learning of mimetics. Two different scales were used to assess participants' proficiency: the amount of exposure to college education in the Japanese language classroom (class level) and general vocabulary knowledge in Japanese.

There were 33 English-speaking participants (16 females, 17 males) who were taking 2nd-year Fall Japanese (N=10), 2nd-year Spring Japanese (N=12), 3rd-year Spring Japanese (N=9), and 4th-year Spring Japanese (N=2) at the University of Kansas. All participants also took a Japanese vocabulary quiz which was created based on the vocabulary from the N3 and N4 levels

of the Japanese Language Proficiency Test (JLPT).

First, Class Level was examined. The participants were grouped into two class levels according to the Japanese class that they were taking at the time of the experiment. 22 participants who were taking a 2nd-year Japanese course in the Fall or Spring semesters were grouped as Beginning level, while 11 participants who were taking a 3rd-year or a 4th-year Japanese course were grouped as Advanced level. In the Experimental Group, there were 12 Beginning participants and 5 Advanced participants. In the Control Group, there were 10 Beginning participants and 6 Advanced participants.

In both the Cloze Test and the Verbal Description Test, there was a significant effect or a strong trend of Class level. In both analyses, the Advanced level participants performed better than the Beginning level participants, indicating that the Advanced level students knew more mimetics than the Beginning level students.

There was also a significant main effect of Pre-Post in both tests, indicating that the participants' performance in both class levels across groups significantly improved after the Learning Session.

In the Cloze Test, there was a significant Pre-Post x Class level interaction. While both class levels successfully learned the mimetics through the Learning Session, the improvement was significantly greater in the Beginning level (+13.0) participants than the Advanced level

(+10.0) participants. In the Verbal Description Test, both class levels successfully learned the mimetics and the Beginning level (+8.8) students improving slightly more than the Advanced level (+5.7) students.

To sum up, the Class Level analysis revealed that both the Beginning level and the Advanced level were successful in learning mimetics through the Learning Session. While the Advanced level participants overall learned more mimetics than the Beginning level participants, the improvement was greater in the Beginning level than the Advanced level students in both Cloze Test and the Verbal Description Test.

Second, general vocabulary knowledge was assessed to further examine proficiency among the participants. All participants took a Japanese vocabulary quiz which was created based on the vocabulary from the N3 and N4 levels of the Japanese Language Proficiency Test (JLPT).

Using the vocabulary quiz score, the participants were divided into 2 proficiency groups, Low Vocabulary Proficiency (score 5-11) and High Vocabulary Proficiency (score 12-16). There were 17 participants in the Low (8 in the Experimental Group and 9 in the Control Group) and 16 participants in the High (9 in the Experimental Group and 7 in the Control Group).

In both the Cloze Test and the Verbal Description Test, there was a significant main effect of Vocabulary. In both tests, the participants with High Vocabulary Proficiency scores overall performed better than those with Low Vocabulary Proficiency scores, indicating that the

participants with High Vocabulary Proficiency scores knew more mimetics than the participants with Low Vocabulary Proficiency scores.

There was also a significant main effect of Pre-Post in both tests, indicating that the participants' performance in both vocabulary levels across groups significantly improved after the Learning Session.

In the Cloze Test, there was a strong trend Pre-Post x Vocabulary interaction. While both the Low and the High Vocabulary Proficiency groups successfully learned the mimetics through the Learning Session, the improvement was slightly greater with the participants with Low Vocabulary Proficiency scores (+13.2) than those with the High Vocabulary Proficiency scores (+10.7). In the Verbal Description Test, there was not a significant Pre-Post x Vocabulary interaction. The performance for both vocabulary proficiency levels improved similarly (High: +6.8, Low: +8.5) after the Learning Session.

To sum up, the Vocabulary knowledge Analysis revealed that both the participants with Low Vocabulary Proficiency scores and High Vocabulary Proficiency scores were successful in learning mimetics during the Learning Session. While the participants with High Vocabulary Proficiency scores overall learned more mimetics than the those with Low Vocabulary Proficiency scores, the improvement was greater in the Low Vocabulary Proficiency scorers than the High Vocabulary Proficiency scorers in the Cloze Test.

The results of the two Proficiency Analyses suggest that regardless of the amount of experience in college Japanese language classes or the amount of general Japanese vocabulary, learners can successfully learn mimetics. While learners with more experience in the Japanese language and who also had more knowledge of general Japanese vocabulary tend to be able to acquire more mimetics than those who have less exposure to the formal education and less vocabulary knowledge, the latter beginning learners tend to show greater improvements in acquiring mimetics. This was true with both explicit and not explicit rule instruction of the sound regularities in Japanese mimetics in the Learning Session.

Chapter 6: Discussion and Conclusions

The current study examined Japanese mimetic words, gitaigo, which imitate physical modes such as actions and physiological states. Unlike Indo-European languages, which have few mimetic words, Japanese has the second largest number of mimetics (following Korean). Mimetic words are frequently used in daily conversations and they provide speakers with a rich means of expression that reveal subtle sensitivity. Despite their frequent use among Japanese native speakers, mimetics are often not explicitly taught in Japanese language classrooms. Given the systematic and frequent use of mimetics, understanding how second language speakers learn mimetics is critical.

The present study examines the second language acquisition of mimetics. A proposed teaching method was introduced to teach Japanese mimetics in the Japanese second language classroom. Mimetics were introduced with a picture and a context along with a verbal description. Two experimental conditions were contrasted: a learning phase where explicit phonological/morphological rules were taught to the learners and one where no explicit teaching was provided. For this explicit learning, learners were taught three phonological/morphological rules during learning. The three rules were: (i) voicing, (ii) gemination, and (iii) reduplication. Each of these phonological factors systematically affects the meaning of mimetics. The present study thus examined whether explicitly teaching these three rules helped English-speaking

learners of Japanese acquire mimetics. Knowledge of the three rules may allow learners to organize mimetics according to the sound regularities and may facilitate learning and remembering mimetics. It may also help learners predict the meaning of newly encountered mimetics.

We contrasted two groups of learners to investigate the learning process. One group explicitly learned the phonological rules when they learned the mimetics (Experimental group) while the Control group learned the same mimetics without explicit identification of the phonological rules. Moreover, by having a posttest and a delayed posttest (approximately 4 weeks later), both retention and long-term retention of mimetic knowledge was investigated. Finally, the current study examined word learning across different L2 proficiencies of the learners.

Each of the phonological/morphological factors of voicing, gemination, and reduplication systematically affects the meaning of mimetics. Mimetics with voiced sounds often express largeness, heaviness, roughness, and aggressiveness of the subject, whereas mimetics with voiceless sounds often express smallness, lightness, smoothness, and quickness. Gemination expresses that the movement/action is quick and instantaneous, or the change of state is quick and occurs at one point. Reduplication expresses that the movement/action is repeated continuously. Knowledge of these rules may help learners organize mimetics according to the sound regularities which may facilitate learning and remembering mimetics. It also may help learners predict the

meaning of newly encountered mimetics.

The following questions were investigated in the present study: (i) whether teaching mimetics with a picture and a context along with a verbal description help learners acquire mimetics, (ii) whether explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) help learners acquire mimetics, (iii) whether explicitly teaching the three phonological/morphological rules help learners retain the knowledge gained during the learning, and finally (iv) whether learners' proficiency affect learning mimetics.

Participants were 33 English-speaking learners of Japanese (16 females, 17 males) who were taking 2nd-year Fall Japanese (N=10), 2nd-year Spring Japanese (N=12), 3rd-year Spring Japanese (N=9), and 4th-year Spring Japanese classes (N=2) at the University of Kansas. Half of the participants were provided with explicit information of the three phonological/morphological rules (Experimental group), whereas the other half did not receive the information explicitly (Control group).

Participants first took a Pretest which consisted of 16 out of 32 training mimetic words (words that were presented during the Learning Session) and a set of 16 untrained mimetic words (words that were not presented during Learning). Approximately one week later, the participants learned the 32 training words during the Learning Session and then took a Posttest on the same day. The Posttest consisted of the same 16 trained words and the 16 untrained words as the Pretest.

Approximately 4 weeks later, a Delayed Posttest was conducted. The same 16 trained words and the 16 untrained words as the Pretest and the Posttest were tested to investigate the retention of the knowledge that the participants gained during the Learning Session.

All the Pretest, the Posttest, and the Delayed Posttest had two types of tests, Cloze Test and Verbal Description Test. The Cloze Test was administered to test whether the participants knew what mimetic word needs to be used in a given context. In the Cloze Test (see Appendix D), the participants were asked to choose an appropriate mimetic word that fits in a sentence from 4 mimetic choices. The Verbal Description Test was administered to test whether the participants could clearly indicate the meaning of mimetics. In the Verbal Description Test (see Appendix E), the participants were asked to choose an appropriate verbal description of a mimetic word from 4 descriptions.

We conducted three types of analyses: Overall Accuracy Analysis, Rule Analysis, and Error Analysis. In the Overall Accuracy Analysis, the correct responses were counted whereas "incorrect and rule-wise-incorrect answers" were examined in the Error Analysis.

We examined whether teaching mimetics with a picture and a context along with a verbal description help learners acquire mimetics by comparing the Pretest results and the Posttest results across groups. Both the Cloze Test results and the Verbal Description Test results showed that there were significant differences in accuracy as well as in error rates between the Pretest and

Posttest across groups. For both the Control Group and the Experimental Group, there were significant improvements in accuracy and significantly fewer errors on the Posttest compared to the Pretest. That is, the Learning Session in which each of 32 mimetics was introduced with a picture and a context along with a verbal description was effective in aiding learners to acquire mimetics.

There was also a significant difference in accuracy between the trained stimuli and the untrained stimuli. In both the Cloze Test and the Verbal Description Test, the trained stimuli were more successfully acquired than the untrained stimuli, suggesting that the Learning Session was effective in the learning of the mimetics, especially those that the participants were trained on.

Next, we examined whether explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) help learners acquire mimetics by comparing the difference between the Pretest and the Posttest in the Control Group and the Experimental Group. For the Cloze Test, while the overall interaction in the accuracy analysis was not significant, the analysis of the errors indicated that there was a difference between the Experimental and Control groups in terms of successful application of the rules. The Experimental Group was even more successful than the Control Group in rule application, that is, explicit learning helped learners acquire the mimetics. For the Verbal Description Test, both the accuracy analysis and the error analysis revealed that the Experimental Group who explicitly learned the rules was even more

successful in learning mimetics with a greater improvement and fewer errors than the Control Group who was not explicitly taught the rules.

These results suggest that while learning mimetics with a picture and a context along with a verbal description is effective, adding an explicit introduction of the three phonological/morphological rules makes it even more helpful for learners to acquire Japanese mimetics.

As for the specific Rule application, there were some differences between the Cloze Test and the Verbal Description Test. For the Cloze Test, the participants overall had the highest accuracy in the Reduplication stimuli among the three rule-based stimulus types. However, accuracy improved (and errors decreased) the most in the Gemination stimuli. These results suggest that while all three rules were successfully learned by the learners in both participant groups, knowing the gemination rule made the greatest change in the correct rule identification and application. This is possibly due to the fact that English does not have geminates in its phonemic inventory; therefore, recognizing gemination in mimetics and knowing that gemination affects the meaning of mimetics was very helpful for English-speaking learners. In fact, the participants had the lowest accuracy for the gemination stimuli on the Pretest (before paying attention to the gemination) and they had the highest accuracy (with the reduplication stimuli) on the Posttest.

The learning data after a 4-week interval revealed that knowledge of mimetics was successfully retained by the participants in both the Control Group and the Experimental Group. Both groups retained their knowledge of mimetics even though they had learned the words 4 weeks earlier. Moreover, for both the Cloze Test and the Verbal Description Test, the Error Analysis showed that while there were significantly fewer incorrect-and-rule-wise-incorrect answers (that is, fewer errors) after the Learning Session in both participant groups, the change was greater (i.e., fewer errors) in the Experimental Group that had been given explicit rules than the Control Group. These results indicate that, 4 weeks after the Learning Session, the Experimental Group who explicitly learned the rules was even more successful in rule identification and application than the Control Group who was not explicitly taught the rules. That is, explicit learning helped learners not only acquire the mimetics but also retain this knowledge. The comparison of learning after a delay suggests that while teaching mimetics with a picture and a context along with a verbal description is effective for learning and retaining the knowledge of mimetics, explicitly teaching the three phonological/morphological rules (voicing, gemination, and reduplication) greatly facilitates learners in acquiring and remembering mimetics.

In the current study, the participants overall performed better on the Verbal Description Test than the Cloze Test. There are two possible reasons for this finding. First, the Verbal Description Test provided short and clear descriptions in English which were easier to process

than the Cloze Test in which sentences and mimetics were provided in Japanese. Second, the content of the Verbal Description Test provided unambiguous information for the participants. In contrast, the context provided in the Cloze Test could have been interpreted in a number of different ways by the participants, rather than what was intended. For example, when the context was "Little Red Riding Hood walked _____ in the woods", a few participants assumed that Little Red Riding Hood was in hurry, therefore she was walking fast making noises. Those participants chose voiced mimetics (dosudosu 'a big heavy person walking' or geragera 'laughing hard') rather than voiceless mimetics (tokotoko 'a small person walking' or kusukusu 'laughing shyly'). With the ambiguous context, the participants did not attribute (the lack of) voicing to the subject (Little Red Riding Hood) but to the action (walking fast, making noises). Therefore, the Verbal Description Test is preferable to assess learners' knowledge since it provides clear information to participants.

Proficiency of the participants was also examined in the current study to investigate whether participants' proficiency in Japanese affects the learning of mimetics. Two different scales were used to assess participants' proficiency: the amount of exposure to college education in the Japanese language classroom (class level) and general vocabulary knowledge in Japanese. The class level is very similar to learners' grammatical knowledge in the Japanese language whereas the vocabulary knowledge is very similar to learners' experience in Japanese (exposure

to the language) regardless of the amount of classroom education.

For both the Beginning level (2nd year) and the Advanced level (3rd and 4th year), participants' performance significantly improved after the Learning Session. While the Advanced level students overall knew more mimetics than the Beginning level students, both the Cloze Test and the Verbal Description Test results showed that the improvement was greater in the Beginning level than in the Advanced level students. These results suggest that the current teaching method is effective regardless of learners' proficiency; the acquisition of mimetics can start at the relatively early stage of learning Japanese (as soon as they can read hiragana).

Similar to the Class level analysis, Vocabulary knowledge analysis also revealed that both the participants with Low Vocabulary Proficiency scores and High Vocabulary Proficiency scores were successful in learning mimetics during the Learning Session. While the participants with High Vocabulary Proficiency scores overall knew more mimetics than those with Low Vocabulary Proficiency scores, the improvement was greater for participants with Low Vocabulary Proficiency scorers than for participants with High Vocabulary Proficiency scorers in the Cloze Test.

The results of the two proficiency analyses suggest that regardless of the amount of experience in college Japanese language classes or the amount of general Japanese vocabulary, learners can successfully learn mimetics. While learners with more experience in the Japanese

language and who also had more knowledge of general Japanese vocabulary know more mimetics than those who have less exposure to formal Japanese education and less vocabulary knowledge, the latter beginning learners with lower vocabulary scores showed greater improvements in acquiring mimetics. This was true with both explicit and non-explicit instructions of the sound regularities in Japanese mimetics in the Learning Session. These results suggest that learning mimetics does not need to be limited to advanced learners as it is today but it can start as early as the 2nd-year Japanese instruction when learners are able to easily read hiragana and katakana and construct simple sentences.

The current study shows that a simple and short learning session can aid the learning of mimetics for second language learners. Mimetic words are frequently used in daily conversations among native Japanese speakers. Thuy (2012) extensively investigated the use of mimetics in daily conversations among Japanese native speakers in various situations. 129 conversations, including 100 hours of daily conversations by 161 female and 37 male speakers (age ranged from 10s to 90s) were examined. Among the 129 conversations, 2733 onomatopoeias (the average of 21 onomatopoeias per conversation) were found. Thuy (2012) listed 60 onomatopoeias which were most frequently used in the conversations, including 57 gitaigo words (words that imitate physical modes such as actions and physiological states), similar to the mimetics in the current study. 23 of those words are also listed in Tamamura (1989) and Mikami (2007) which suggest

that they are also commonly used in written documents. Therefore, mimetics are extensively and frequently used in both spoken and written interactions among Japanese native speakers. It is crucial for learners of Japanese to know mimetics in order for them to communicate with Japanese people or to enjoy Japanese authentic media such as books, websites, and TV.

Despite their frequent use in daily conversations among Japanese native speakers, mimetics are not taught in many Japanese language classrooms. In fact, not many Japanese textbooks introduce mimetics and most mimetics are not even listed in regular dictionaries. In three of the most commonly used Japanese textbooks for beginning and intermediate learners in the US, only a small number of mimetics are introduced. Only one mimetic is introduced in Nakama 1: Japanese Communication, Culture, Context (World Languages) (3rd edition) (Hatasa, Hatasa, and Makino, 2014) and Nakama 2: Japanese Communication, Culture, Context (2nd edition) (Hatasa, Hatasa, and Makino, 2011); 5 mimetics in GENKI I and II: An Integrated Course in Elementary Japanese I and II (2nd edition) (Banno, Ikeda, and Ohno, 2011); and 6 mimetics in Minna no Nihongo Book 1 and 2 (2nd edition) (Tanaka, Makiono, Shigekawa, Mikogami, Koga, Sawata, Shinya, 2012). Since Indo-European languages have few mimetic words, English-speaking learners of Japanese often do not even know what mimetics are and how they are different from sound words which are usually categorized as onomatopoeias in English. The only exposure to Japanese mimetics are when learners have contact with authentic language sources

such as conversations with Japanese native speakers, Japanese books, magazines, comic books, and Japanese TV. Thus, learners are rarely exposed to mimetics in textbooks or in the second language classroom.

The importance of teaching mimetics to learners of Japanese is starting to be addressed among Japanese instructors. Nishimura and Takeuchi (2011) argued that learners who intend to live or work in Japan need to learn mimetics. Moreover, the National Institute for Japanese Language and Linguistics created a website in 2004 where they introduce 89 Japanese mimetics with verbal contexts for second language learners of Japanese (https://pj.ninjal.ac.jp/archives/Onomatope/index.html) to learn Japanese mimetics. Each mimetic is described with verbal description for different meanings, short sentences that include the mimetic, conversations that contain the mimetic, and short comic strips. Learning mimetics can make communication richer with expressions that are not found in regular Japanese dictionaries. Unlike Korean mimetics that often carry only one meaning per word, a Japanese mimetic can carry several meanings in one word depending on the context (Tsujimura and Deguchi, 2007). Therefore, it is additionally important to teach mimetics with context. However, everything on the website is written in Japanese with a good amount of kanji characters (Chinese characters). Therefore, only advanced learners are able to learn mimetics from this website.

The current study provided a method to teach both beginning and advanced learners.

Teaching mimetics does not need to be limited to only advanced learners since learners at the beginning level (those who can read hiragana and katakana) were successful in acquiring mimetics and they showed even greater improvements than advanced learners. It is important for beginning learners of Japanese to be aware of mimetics and their important role in communication in Japanese language. Teaching mimetics and starting to learn mimetics at a relatively early stage can scaffold later learning and build vocabulary for richer communication.

The current study proposed a method to teach mimetics to second language learners at both beginning and more advanced levels of proficiency. The method was implemented for English-speaking learners of Japanese to learn Japanese mimetics. We found that teaching mimetics with a picture and a context along with a verbal description is effective in learning and remembering mimetics regardless of proficiency level. In addition, we found that explicit teaching of the three phonological/morphological rules (voicing, gemination, and reduplication) facilitates learning mimetics. Knowing the sound regularities helps learners understand the meaning of the mimetics, and it allows learners to predict the meaning of newly encountered mimetics. The current methodology was highly successful for mimetic learning for second language learners.

The proposed methodology can be easily implemented in a classroom environment with very little effort and no sophisticated technology. Instructors can first introduce what mimetics are in Japanese and when people use them, include describing manners of action, conditions and

states of objects. Instructors can then introduce some mimetics that learners can easily use in their daily life such as *pekopeko* 'being hungry' in a context. *Pekopeko* has another meaning 'to bow continuously'. This can be contrasted to *pekott* which means 'to bow once quickly'. Instructors can introduce them in contexts with pictures along with verbal descriptions. For this pair, you can introduce the reduplication rule and the gemination rule. The current study has shown that knowing the sound regularities of mimetics will facilitate vocabulary learning.

Mimetics can be introduced in everyday situations such as talking about your health condition and cooking where mimetics are frequently used. Also, since mimetics are often used in commercial products, instructors can use authentic materials as the source to introduce mimetics such as product labels and store websites.

Teaching sound regularities in mimetics to learners not only leads to learners' successful acquisition of mimetics but also can inspire learners with the connection between the sound and the meaning that is part of the Japanese language. Mimetics play an important role in both verbal and written communications in Japanese. Second language acquisition must represent an authentic environment. It is critical therefore for Japanese instructors to teach mimetics to second language learners which are frequently and extensively used in Japanese. With very little effort, the proposed method can be implemented in the classroom. Students will have exposure to mimetics and be able to successfully learn mimetics. Having knowledge of mimetics will certainly

help learners understand authentic language sources. Moreover, it will enable learners to communicate with richer and more natural expressions.

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Appendix A:

The 32 words introduced in the digital picture book system (Maeda et al. 2015)

Mimetic or Sound word	Stimuli	Relation
sound mimetic	za:za: 'raining heavily', shitoshito 'raining quietly'	different degrees of raining
mimetic mimetic	tekuteku 'walk at steady pace' noronoro 'walk slowly, sluggishly'	different manners of walking
mimetic mimetic	perapera 'chatter' waiwai 'noisily'	similar manners of talking/speaking
mimetic mimetic	ji:tt 'stare steadily' kyorokyoro 'look around restlessly'	opposite manners of watching
mimetic sound	shikushiku 'to whimper' wa:n 'to cry loudly'	different degrees of crying
mimetic mimetic	dokidoki 'nervous' bikubiku 'be in fear'	similar manners of being nervous
mimetic mimetic	nikoniko 'to smile' iraira 'to be irritated'	opposite states and feelings
mimetic mimetic	pekopeko 'to bow repeatedly' pekori 'to bow once'	repeated action
mimetic mimetic	kokukoku 'to nod repeatedly' kokuri 'to nod once'	repeated action
mimetic mimetic	chokon 'to sit using a small space' dokkari 'to sit using a wide space'	opposite manners of sitting
sound mimetic	gatagata 'to rattle' burabura 'to dangle'	similar manners of shaking
mimetic mimetic	chikachika 'a lamp turning on and off' kirakira 'to shine brightly'	similar manners of lighting
sound sound	byuntt 'sound of an object flying fast' bu:n 'sound of an object flying'	different manners of flying
mimetic mimetic	dekoboko 'rough surface' tsurutsuru 'smooth surface'	opposite texture
mimetic mimetic	pintt 'well tightened' yuruyuru 'loosely tightened'	opposite states of a rope
mimetic mimetic	zuruzuru 'to drag, to trail' gorogoro 'to roll a heavy object'	similar manners of dragging

Appendix B:

Participant Questionnaire on language background

Questionnaire

Gender: _____

Age: _____

Native country: _____

Native language: _____

Knowledge of OTHER languages:

Write the name of the language in the blank, and indicate your approximate abilities in each of the four areas for each language.

1. Language: _____

Speaking	Listening	Reading	Writing
□ Poor	□ Poor	□ Poor	□ Poor
□ Fair	□ Fair	□ Fair	□ Fair
□ Good	□ Good	□ Good	□ Good
□ Near-Native	□ Near-Native	□ Near-Native	□ Near-Native

2. Language: _____

Speaking	Listening	Reading	Writing
□ Poor	□ Poor	□ Poor	□ Poor
□ Fair	□ Fair	□ Fair	□ Fair
□ Good	□ Good	□ Good	□ Good
□ Near-Native	□ Near-Native	□ Near-Native	□ Near-Native

3. Language: _____

Speaking	Listening	Reading	Writing
□ Poor	□ Poor	□ Poor	□ Poor
□ Fair	□ Fair	□ Fair	□ Fair
□ Good	□ Good	□ Good	□ Good
□ Near-Native	□ Near-Native	□ Near-Native	□ Near-Native

1. What was your age when you first started learning Japanese? _____

2. What Japanese classes have you taken at KU? (e.g. JPN104 and 108)

_____

3. Did you take any Japanese classes prior to university education? Yes No

If yes, where? _____

For how many years? _____

4. Have you taken any other language classes before? Yes No

If yes, where? _____

For how many years? _____

5. Have you lived or visited Japan? Yes No

If yes, for what purpose and for how long? (e.g. trip for a week, study abroad for a year)

_____

_____

6. Have you lived in any other non-English-speaking countries? Yes No

If yes, where? _____

For how long? _____

7. Have you had any informal, out of classroom, exposure to Japanese? Yes No

If yes, please mark all exposure you have had and its amount of time.

--------- Music in Japanese (_____hours per week)

--------- Japanese languages magazines or newspapers (_____hours per week)

--------- Japanese manga written in Japanese

→How many manga books have you read in Japanese? _____

--------- Japanese manga written in English

→How many manga books have you read in English? _____

--------- TV in Japanese including anime (_____hours per week)

--------- Japanese-speaking relatives (talk with them in JPN for _____ hours per week)

--------- Japanese-speaking friends (talk with them in JPN for _____ hours per week)

--------- Vacation travel to Japan (_____times a year)

--------- Other exposure to Japanese (such as _____)

8. Do you know what “mimetic words” are in Japanese? Yes No

If Yes, what are they?

_____

_____

Thank you for your participation!

Appendix C:

Vocabulary Quiz in the current study

<<Vocabulary Quiz>>

Please choose and **circle** the most appropriate word for each sentence from (a), (b), (c), or (d).

１．私は日本のまんがに _____ があります。
a. きぶん　b. きょうみ　c. こころ　d. びょうき

２．今日は _____ がふっています。
a. はれ　b. くも　c. そら　d. ゆき

３．すずきさんは、_____ シャツを着ている人です。
a. まるい　b. くらい　c. きいろい　d. あかるい

４．入口の前には、車を _____ ください。
a. とめないで　b. しめないで　c. やめないで　d. きめないで

５．日本でいろいろな _____ をしました。
a. しょくどう　b. けいけん　c. がくせい　d. せつめい

６．私の家は、駅から _____ ５分です。
a. あるいて　b. すわって　c. なおって　d. かわいて

７．地下鉄ができて _____ になりました。
a. きれい　b. たいへん　c. ひま　d. べんり

８．この荷物をあそこに _____ ください。
a. つたえて　b. ひろって　c. はこんで　d. むかえて

９．_____ にトイレがどこにあるか、聞きました。
a. しょうせつ　b. てんいん　c. にっき　d. みずうみ

１０．テストでとてもいい点がとれて、_____ です。
a. かなしい　b. うれしい　c. おかしい　d. たのしい

１１．あの時計は　＿＿＿＿＿　います。
a. おくれて　　b. はしって　　c. かくれて　　d. おちて

１２．このオレンジは、アメリカ　＿＿＿＿＿　です。
a. せい　　b. さく　　c. けい　　d. さん

１３．将来のために、お金を　＿＿＿＿＿　います。
a. くわえて　　b. かさねて　　c. のせて　　d. ためて

１４．この計算は　＿＿＿＿＿　ので、コンピューターを使いましょう。
a. いがいな　　b. じゅうだいな　　c. ふくざつな　　d. せいじょうな

１５．二人で　＿＿＿＿＿　すれば、仕事も早く終わるでしょう。
a. がまん　　b. きょうりょく　　c. へんしん　　d. めいれい

１６．この子供は　＿＿＿＿＿　話を聞いて、泣き出してしまいました。
a. はずかしい　　b. つらい　　c. おそろしい　　d. くやしい

１７．試験の結果が　＿＿＿＿＿　されました。
a. はっぴょう　　b. しつもん　　c. あんない　　d. ちゅうもん

１８．私は妻といっしょに電車で　＿＿＿＿＿　います。
a. うえて　　b. みおくって　　d. しじして　　d. つうきんして

１９．私の考えに　＿＿＿＿＿　がある人は、言ってください。
a. おうぼ　　b. ふまん　　c. もくひょう　　d. そうだん

２０．＿＿＿＿＿　人は、うそをつきません。
a. けんこうな　　b. しんせつな　　c. しょうじきな　　d. あんしんな

Appendix D:

Cloze Test (Pretest) in the current study

Thank you for participating in the experiment!

There are 32 Japanese sentences along with English translations on this sheet and each of them is missing a mimetic word. Please circle the most appropriate mimetic word out of four choices for each sentence.

Example:

まだ朝(あさ)ごはんを食(た)べていないので、おなかが_____です。

I have not eaten breakfast yet, so I am _____.

a. べろべろ　b. ぺこぺこ　c. へこへこ　d. ぺろぺろ

水をとってくれますか？のどが_____です。

Will you pass me the water? I am _____.

a. がらがら　b. どんどん　c. とんとん　d. からから

1. 幕(まく)を_____ひきました。

I pulled the curtain _____.

a. とことこ　b. ずるずる　c. どすどす　d. するする

2. この部屋(へや)は_____してうるさいです。

This room is _____ and loud.

a. ころころ　b. しーんと　c. ざわざわ　d. ごろごろ

3. ビー玉(だま)が_____転(ころ)がっています。

The marble is rolling _____.

a. さらさら　b. ころころ　c. ごろごろ　d. ざらざら

4. 大(おお)きいスーツケースを_____ひきました。

I pulled a big suitcase _____.

a. とことこ　　b. どすどす　　c. ずるずる　　d. するする

5. 大(おお)きい 男(おとこ) の人(ひと)は_____笑(わら)いました。

The big man laughed _____.

a. どろどろ　　b. くすくす　　c. げらげら　　d. とろとろ

6. もうすぐクリスマスなので、みんな_____しています。

It is almost Christmas and everybody is _____.

a. にこにこ　　b. いらいら　　c. にこっと　　d. いらっと

7. 嘘(うそ)がばれないかと、_____しました。

I was _____ that my lie would be revealed.

a. びくびく　　b. じろっと　　c. じろじろ　　d. びくっと

8. 雨(あめ)で道(みち)がぬかるんで、_____しています。

The road is _____ because of the rain.

a. どろどろ　　b. するする　　c. とろとろ　　d. ずるずる

9. 蛇口(じゃぐち)がゆるくて、水(みず)が_____出(で)ています。

The faucet is leaky and water is _____ from it.

a. ざわざわ　　b. ちょろちょろ　　c. しーんと　　d. じゃあじゃあ

10. 席(せき)を横取(よこど)りされて、_____しました。

I was _____when somebody took my seat.

a. いらいら　　b. ちらっと　　c. ちらちら　　d. いらっと

11. 針(はり)が指(ゆび)にあたって、_____しました。

The needle pricked my finger and it felt _____.

a. びくびく　　b. ちくちく　　c. びくっと　　d. ちくっと

12. 抜(ぬ)き打(う)ちクイズと聞(き)いて、_____唾(つば)をのみました。

Hearing the teacher say pop quiz made me take a _____ gulp.

a. ごくごく　　b. にこにこ　　c. にこっと　　d. ごくっと

13. 突然大(とつぜんおお)きい音(おと)がして、_____しました。

Suddenly there was a loud noise and I was _____.

a. じろじろ　　b. びくっと　　c. じろっと　　d. びくびく

14. シルクのパジャマは_____しています。

The silk pajamas are _____.

a. ちょろちちょろ　　b. じゃあじゃあ　c. ざらざら　　d. さらさら

15. ホースから、水(みず)が勢(いきお)いよく_____出(で)ています。

The water is _____ out of the hose with great force.

a. じゃあじゃあ　b. しーんと　　c. ちょろちょろ　d. ざわざわ

16. 赤(あか)ずきんは_____森(もり)の中を歩(ある)きました。

Little Red Riding Hood walked _____ in the woods.

a. げらげら　　b. とことこ　　c. くすくす　　d. どすどす

17. 雷(かみなり)が_____光(ひか)りました。

The lightning flashed _____.

a. ちくっと　　b. ぴかっと　　c. ぴかぴか　　d. ちくちく

18. 大男(おおおとこ)は_____音(おと)をたてて歩(ある)きました。

The giant walked _____ making noise.

a. どすどす　　b. くすくす　　c. とことこ　　d. げらげら

19. 大(おお)きいタイヤが_____転(ころ)がっています。

A big tire is rolling _____.

a. ごろごろ　　b. さらさら　　c. ころころ　　d. ざらざら

20. 目(め)があうと、彼(かれ)はいつも_____します。

He always _____ when our eyes meet.

a. いらいら　　b. にこっと　　c. いらっと　　d. にこにこ

21. ばれないように、一度(いちど)だけ_____見(み)ました。

I only _____ once so that I won't be caught.

a. ごくっと　　b. ちらっと　　c. ちらちら　　d. ごくごく

22. 人(ひと)をずっと_____見(み)てはいけません。

You should not look at people _____.

a. ぴかっと　　b. じろっと　　c. じろじろ　　d. ぴかぴか

23. 黄色信号(きいろしんごう)が_____光(ひか)りました。

The yellow traffic light was flashing _____.

a. ぴかぴか　　b. ちくちく　　c. ちくっと　　d. ぴかっと

24. 小(ちい)さい女(おんな)の子(こ)は_____恥(は)ずかしそうに笑(わら)いました。

The little girl laughed shyly _____.

a. とろとろ　　b. どろどろ　　c. げらげら　　d. くすくす

25. ビーチの砂で、床が_____しています。

The floor is _____ because of the sand from the beach.

a. さらさら　　b. じゃあじゃあ　　c. ざらざら　　d. ちょろちょろ

26. たばこをポイ捨てした時、友達に_____にらまれました。

When I threw my cigarette on the street, my friend glared at me _____.

a. ぴかぴか　　b. じろじろ　　c. ぴかっと　　d. じろっと

27. パーティが終わったようです。部屋は_____しています。

It seems like the party has ended. The room is _____.

a. ごろごろ　　b. ざわざわ　　c. ころころ　　d. しーんと

28. 彼はしばらく、こちらを_____見ました。

He was looking _____ at me for a while.

a. ちらちら　　b. ごくっと　　c. ちらっと　　d. ごくごく

29. 渋滞に巻き込まれて、_____しました。

I was _____ by being caught in a traffic jam.

a. ちらちら　　b. ちらっと　　c. いらいら　　d. いらっと

30. ヨーグルトは_____していて、赤ちゃんでも食べられます。

Since yogurt is _____, babies can eat it.

a. ずるずる　　b. とろとろ　　c. どろどろ　　d. するする

31. このセーターは、首が_____します。

This sweater makes my neck feel _____.

a. びくっと　　b. びくびく　　c. ちくちく　　d. ちくっと

32. のどが渇(かわ)いていたので、水(みず)をたくさん_____飲(の)みました。

I drank a lot of water _____ because I was thirsty.

a. にこっと　　b. にこにこ　　c. ごくごく　　d. ごくっと

Appendix E:

Verbal Description Test (Pretest) in the current study

There are 32 questions in which you will be asked the meaning of mimetic words.

Please choose and circle the most appropriate meaning of the mimetic word out of four choices

Example:

What is the meaning of ぺこぺこ？

a. Being sick

b. Being hungry

c. To speak fluently

d. To mumble

What is the meaning of からから？

a. To knock on the door

b. To tap the table

c. Being sad

d. Being thirsty

1. What is the meaning of するする？

a. Someone small is walking

b. To drag/pull something heavy

c. Someone big is walking

d. To drag/pull something smoothly

2. What is the meaning of ざわざわ？

a. A small/light object rolling

b. Being quiet

c. Many people talking

d. A big/heavy object rolling

3. What is the meaning of ころころ？

a. Smooth and silky texture

b. A small/light object rolling

c. A big/heavy object rolling

d. Rough and sandy texture

4. What is the meaning of ずるずる？

a. Someone small is walking

b. Someone big is walking

c. To drag/pull something heavy

d. To drag/pull something smoothly

5. What is the meaning of げらげら？

a. Muddy liquid

b. To laugh shyly

c. To laugh hard

d. Smooth liquid

6. What is the meaning of にこにこ?

a. To smile consecutively

b. To be irritated consecutively

c. To smile once quickly

d. To get irritated once quickly

7. What is the meaning of びくびく？

a. To be in fear

b. To glare at something once quickly

c. To stare at something/someone

d. To be startled.

8. What is the meaning of どろどろ?

a. Muddy liquid

b. To drag/pull something smoothly

c. Smooth liquid

d. To drag/pull something heavy

9. What is the meaning of ちょろちょろ?

a. Many people talking

b. Trickling water

c. Being quiet

d. Gushing water

10. What is the meaning of いらっと?

a. To be irritated consecutively

b. To take a peek once quickly

c. To sneak peek repeatedly

d. To get irritated once quickly

11. What is the meaning of ちくっと?

a. To be in fear

b. Something prickles or something itchy

c. To be startled

d. Something stings/pricks once quickly

12. What is the meaning of ごくっと?

a. To drink something consecutively

b. To smile consecutively

c. To smile once quickly

d. To swallow once quickly

13. What is the meaning of びくっと?

a. To stare at something/someone

b. To be startled

c. To glare at something once quickly

d. To be in fear

14. What is the meaning of さらさら?

a. Trickling water

b. Gushing water

c. Rough and sandy texture

d. Smooth and silky texture

15. What is the meaning of じゃあじゃあ?

a. Gushing water

b. Being quiet

c. Trickling water

d. Many people talking

16. What is the meaning of とことこ?

a. To laugh hard

b. Someone small is walking

c. To laugh shyly

d. Someone big is walking

17. What is the meaning of ぴかっと?

a. Something stings/pricks once quickly

b. To flash once quickly

c. To flash repeatedly

d. Something prickles or something itchy

18. What is the meaning of どすどす?

a. Someone big is walking

b. To laugh shyly

c. Someone small is walking

d. To laugh hard

19. What is the meaning of ごろごろ?

a. A big/heavy object rolling

b. Smooth and silky texture

c. A small/light object rolling

d. Rough and sandy texture

20. What is the meaning of にこっと?

a. To be irritated consecutively

b. To smile once quickly

c. To get irritated once quickly

d. To smile consecutively

21. What is the meaning of ちらっと?

a. To swallow once quickly

b. To take a peek once quickly

c. To sneak peek repeatedly

d. To drink something consecutively

22. What is the meaning of じろじろ?

a. To flash once quickly

b. To glare at something once quickly

c. To stare at something/someone

d. To flash repeatedly

23. What is the meaning of ぴかぴか?

a. To flash repeatedly

b. Something prickles or something itchy

c. Something stings/pricks once quickly

d. To flash once quickly

24. What is the meaning of くすくす?

a. Smooth liquid

b. Muddy liquid

c. To laugh hard

d. To laugh shyly

25. What is the meaning of ざらざら?

a. Smooth and silky texture

b. Gushing water

c. Rough and sandy texture

d. Trickling water

26. What is the meaning of じろっと?

a. To flash repeatedly

b. To stare at something/someone

c. To flash once quickly

d. To glare at something once quickly

27. What is the meaning of しーん?

a. A big/heavy object rolling

b. Many people talking

c. A small/light object rolling

d. Being quiet

28. What is the meaning of ちらちら?

a. To sneak peek repeatedly

b. To swallow once quickly

c. To take a peek once quickly

d. To drink something consecutively

29. What is the meaning of いらいら?

a. To sneak peek repeatedly

b. To take a peek once quickly

c. To be irritated consecutively

d. To get irritated once quickly

30. What is the meaning of とろとろ?

a. To drag/pull something heavy

b. Smooth liquid

c. Muddy liquid

d. To drag/pull something smoothly

31. What is the meaning of ちくちく?

a. To be startled

b. To be in fear

c. Something prickles or something itchy

d. Something stings/pricks once quickly

32. What is the meaning of ごくごく?

a. To smile once quickly

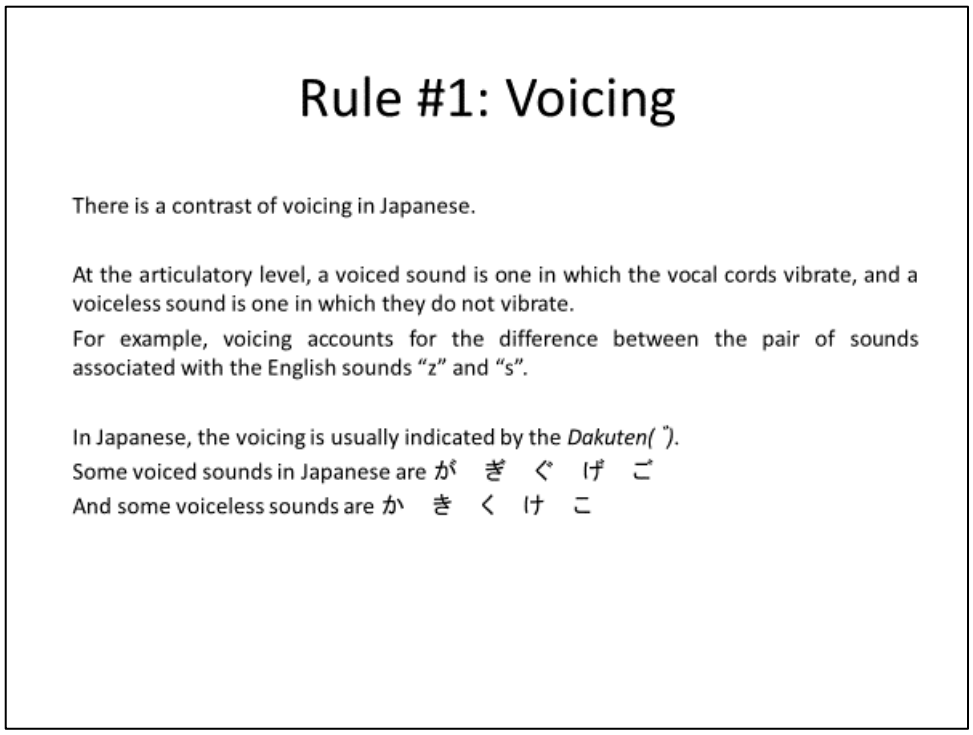
b. To smile consecutively

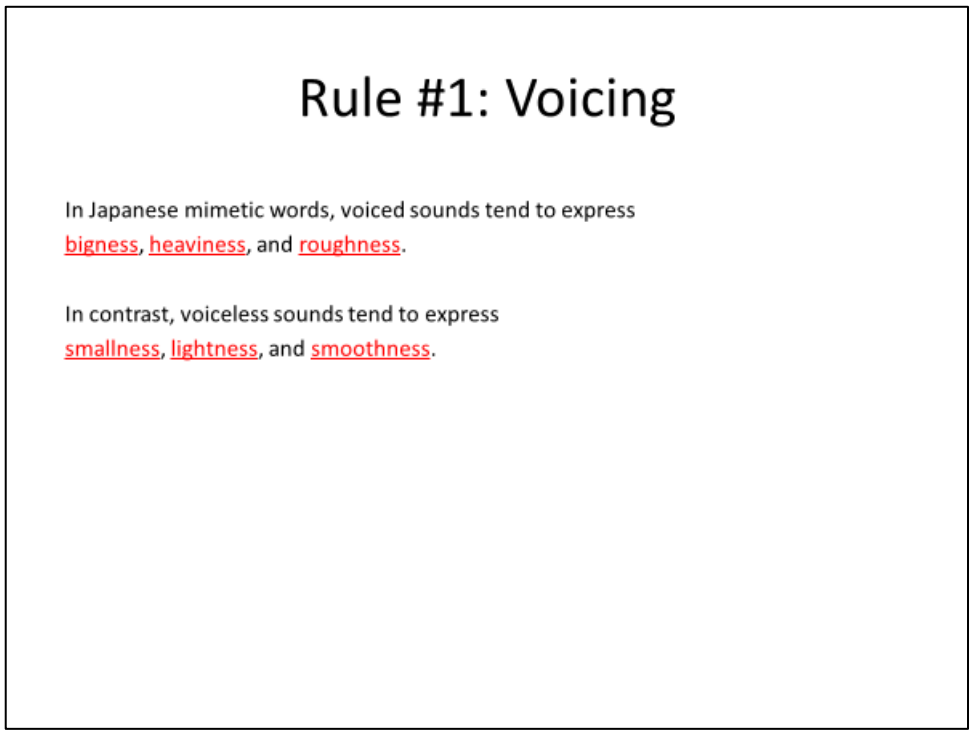
c. To drink something consecutively

d. To swallow once quickly

Appendix F:

Voicing Rule instructions used during the Learning Session for the Experimental Group





Rule #1: Voicing

For example, both ぐるん and くるん mean to 'roll once'.
However, the voicing indicates "what" rolls.

The voiced ぐるん indicates that the subject is big and heavy.

ぐるん "gurun"
=big/heavy object rolling once

The voiceless くるん indicates that the subject is small and light.

くるん "kurun"
=small/light object rolling once

Rule #1: Voicing

Now, you will learn 16 mimetic words in pairs that contrast in voicing.

On each slide, you will learn one mimetic word.
There will be an example sentence and a picture that describes the meaning of the mimetic word.
The word description and sentence will appear as you press the space bar.

You will hear the word and you will hear the sentence.
You may listen to the audio as many times as you want by clicking the speaker symbols.

After learning the mimetic word, there will be a follow-up question in which you will be asked to write the mimetic word that fits in the provided sentence.
Please write that mimetic word in the provided sentence on your answer sheet.

Appendix G:

Reduplication and Gemination Rule instructions used during the Learning Session for the Experimental Group.

Rule #2: Reduplication

Reduplication is when a part of a word or even the whole word is repeated (exactly or with a slight change).

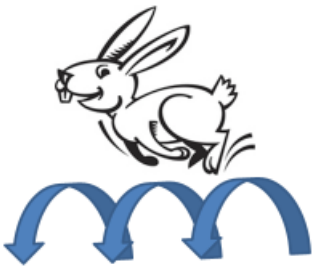
For example, とき means 'time'. When とき is reduplicated (with a slight change), it becomes ときどき which means 'sometimes'.

Rule #2: Reduplication

In many Japanese words, reduplication indicates that the action is repeated many times or it is used to describe the stable state of the subject (e.g. zarazara describes the rough texture of sand paper)

For example, ぴょん means 'to jump once'.

When you reduplicate it and say ぴょんぴょん, it means 'to jump repeatedly'.



Rule #3: Gemination

There is one more rule to learn before start learning more mimetic words.

Double consonants are called "gemination" in Japanese. Gemination is represented with the *sokuon*, a small つ (tsu).

Gemination makes a big difference in word meaning. For example, さか (saka) is a 'slope' whereas さっか (sakka) with a small つ means a 'writer'.

Rule #3: Gemination

In Japanese mimetic words, the gemination (small つ) tends to add quickness to the action and that the action took place once and it is instantaneous.

For example, a reduplicated word きらきら means 'to shine repeatedly/consecutively'. Therefore it can be used to describe shining stars.

On the other hand, きらっ means 'to shine instantaneously and quickly', thus it can be used to describe a shooting star.

Rule #3: Gemination

Mimetic words ending with the genimation such as きらっ are usually accompanied by と when used as adverb.

Ex: 流(なが)れ星(ぼし)が、きらっと光(ひか)りました。
'A shooting start shined quickly and instantaneously'

Rule #2 Reduplication
Rule #3 Gemination

Now, you will learn 16 mimetic words that are reduplication-gemination pairs.

On each slide, you will learn one mimetic word.
There will be an example sentence and a picture that describes the meaning of the mimetic word.
The word description and sentence will appear as you press the space bar.

You will hear the word and you will hear the sentence.
You may listen to the audio as many times as you want by clicking the speaker symbols.

After learning the mimetic word, there will be a follow-up question in which you will be asked to write the mimetic word that fits in the provided sentence.
Please write that mimetic word in the provided sentence on your answer sheet.